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EP 99/7616

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The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. Patent application No. Demande de brevet n°

99810514.2

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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
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G. PASTUREL

DEN HAAG, DEN
THE HAGUE,
LA HAYE, LE

27/07/99



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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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Colour Photographic Material

The present invention relates to colour photographic material comprising a certain lacton (benzofuran-2-one) type compound, to the use of this compound as an additive to photographic material, especially as scavenger for the oxidised form of the developer (Dox-scavenger), to some new compounds of the benzofuran-2-one class, and their use as stabilisers for organic material against oxidative, thermal and/or light-induced degradation.

It is well known that one of the problems associated with colour photography is the diffusion of the oxidised colour developer away from the light sensitive silver halide emulsion layer in which it is formed into another silver halide emulsion layer, which can result in the formation of unwanted dyes at undesired places. For instance, while being generated in the green sensitive layer and forming a magenta dye through a coupling reaction with the incorporated magenta coupler, the oxidised developer can also diffuse to the red sensitive layer thereby producing unwanted cyan dye or to the blue sensitive layer thereby producing unwanted yellow dye. This kind of colour formation in the wrong layers will damage the colour balance of the photographic image and thus result in poor colour reproduction. One way of circumventing this problem is to incorporate oxidised developer scavengers in interlayers between the light sensitive silver halide emulsion layers. These scavengers should have additional properties such as low tendency to migrate, good stability towards aerial oxidation and high solubility in photographic oils.

Several classes of compounds that are useful as scavengers for oxidised developers are known in literature, e.g. specific derivatives of hydroquinone (US-2336327, US-2732300, US-3700453, US-4345016, JP-A 83-021249, JP-A 86-083 536 and JP-A 88-046 451); hydrazines (EP-A-338 785, EP-A-679 944, US-4923 787); sulphonamidophenol (EP-A-654702, US-4447523, JP-A 85-118 835); gallic acid (US-4476219, US-4474874, JP-A 93-002 249, JP-A 86-083 536); resorcinol (US-3770431, US-3772014); catechol (US-4175969, US-4252893, EP-A-727706); aminophenol or aminonaphthol (RD 178, 94-7, 1979); natural antioxidants such as vitamin E or vitamin C (US-2360290, US-2710801).

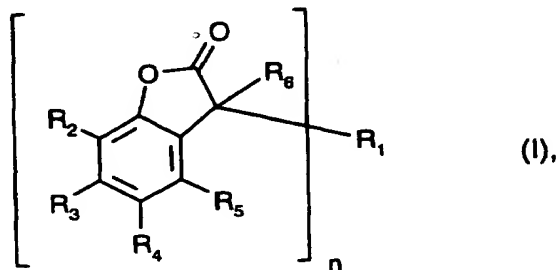
Photographic material containing a certain type of benzofuran-2-one is mentioned in US-3615521 (use as precursor of photographic developing agent) and in US-4366240 (hydroxy substituted compounds as electron donor precursors for reducible color providing

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compounds). A defensive publication US 904 003 (19.11.1971) discloses some aryl-benzofuran-2-ones as competitive couplers for use in photographic developer compositions or in light sensitive silver halide emulsion layers. DE-A-197 49 083 mentions the use of a symmetrically substituted 3-(2-hydroxyphenyl)-benzofuran-2-one in the interlayer of a colour photographic material.

It has now been found that certain compounds of the 3-aryl-benzofuran-2-one class are especially useful as additives to photographic material. They are effective in a number of applications and find utility, for example, as scavengers for the oxidised developer (also termed hereafter Dox scavengers), as dye stabilisers, as antioxidants or as antifoggants. Liquid compounds of the below formula I can also be used as a photographic oil. These compounds are especially stable towards aerial oxidation, diffuse fast and also exhibit a good solubility in high boiling photographic oils. They are well suited for use in photographic elements containing pyrazolotriazole couplers as magenta dye providing compounds, since they are harmless to the light fastness of magenta images obtained from such pyrazolotriazole couplers when compared to hydroquinones.

Primary subject of the invention is a process for preventing migration of the oxidised developer in a colour photographic material from one colour sensitive layer to another by incorporating a compound of the formula I into said material

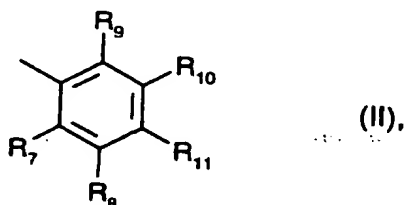


wherein, if $n = 1$,

R_1 is naphthyl, phenanthryl, anthryl, 5,6,7,8-tetrahydro-2-naphthyl, 5,6,7,8-tetrahydro-1-naphthyl, thienyl, benzo[b]thienyl, naphtho[2,3-b]thienyl, thianthrenyl, dibenzofuryl, chromenyl, xanthenyl, phenoxathiinyl, pyrrolyl, imidazolyl, pyrazolyl, pyrazinyl, pyrimidinyl, pyridazi-

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nyl, indoliziny, isoindolyl, indolyl, indazolyl, purinyl, quinoliziny, isoquinolyl, quinolyl, phthalaziny, naphthyridinyl, quinoxaliny, quinazoliny, cinnoliny, pteridinyl, carbazolyl, β -carboliny, phenanthridinyl, acridinyl, perimidinyl, phenanthrolinyl, phenazinyl, isothiazolyl, phenothiazinyl, isoxazolyl, furazanyl, biphenyl, terphenyl, fluorenyl or phenoxazinyl, each of which is unsubstituted or substituted by C_1 - C_4 alkyl, C_1 - C_4 alkoxy, C_1 - C_4 alkylthio, hydroxy, halogen, amino, C_1 - C_4 alkylamino, phenylamino or di(C_1 - C_4 -alkyl)amino, or R_1 is a radical of formula II



and, if $n = 2$,

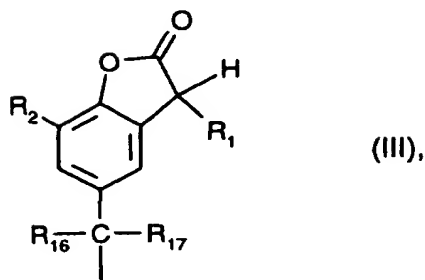
R_1 is unsubstituted or C_1 - C_4 alkyl- or hydroxy-substituted phenylene or naphthylene; or $-R_{12}-X-R_{13}-$,

R_2 , R_3 , R_4 and R_5 are each independently of one another hydrogen, chloro, hydroxy, C_1 - C_{25} alkyl, C_7 - C_9 phenylalkyl, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; unsubstituted or C_1 - C_4 alkyl-substituted C_5 - C_8 cycloalkyl; C_1 - C_{18} alkoxy, C_1 - C_{18} alkylthio, C_1 - C_4 alkylamino, di(C_1 - C_4 -alkyl)amino, C_1 - C_{25} alkanoyloxy, C_1 - C_{25} alkanoylamino, C_3 - C_{25} alkenoyloxy;

C_3 - C_{25} alkanoyloxy which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$; C_6 - C_9 cycloalkyl-

carbonyloxy, benzoyloxy or C_1 - C_{12} alkyl-substituted benzoyloxy; or R_2 and R_3 , or R_3 and R_4 , or R_4 and R_5 , together with the linking carbon atoms, form a benzene ring; or R_4 is $-C_mH_{2m}-COR_{15}$ or $-(CH_2)_qOH$ or, if R_3 , R_5 and R_6 are hydrogen, R_4 is additionally a radical of formula III

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wherein R_1 is as defined above for $n = 1$;

R_6 is hydrogen or, when R_4 is hydroxy, R_6 can also be C_1 - C_{25} alkyl or C_3 - C_{25} alkenyl;

R_7 , R_8 , R_9 , R_{10} and R_{11} are each independently of one another hydrogen, halogen, hydroxy,

C_1 - C_{25} alkyl; C_2 - C_{25} alkyl which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$; C_1 - C_{25} alkoxy;

C_2 - C_{25} alkoxy which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$; C_1 - C_{25} alkylthio, C_3 - C_{25} -

alkenyl, C_3 - C_{25} alkenyloxy, C_3 - C_{25} alkynyl, C_3 - C_{25} alkynyloxy, C_7 - C_9 phenylalkyl, C_7 - C_9 phenyl-alkoxy, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; unsubstituted or C_1 - C_4 alkyl-substituted phenoxy; unsubstituted or C_1 - C_4 alkyl-substituted C_5 - C_8 cycloalkyl; unsubstituted or C_1 - C_4 alkyl-substituted C_5 - C_8 cycloalkoxy; C_1 - C_4 alkylamino, di(C_1 - C_4 alkyl)amino, C_1 - C_{25} alka-

noyl; C_3 - C_{25} alkanoyl which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$; C_1 - C_{25} alkanoyl-

oxy; C_3 - C_{25} alkanoyloxy which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$; C_1 - C_{25} alka-

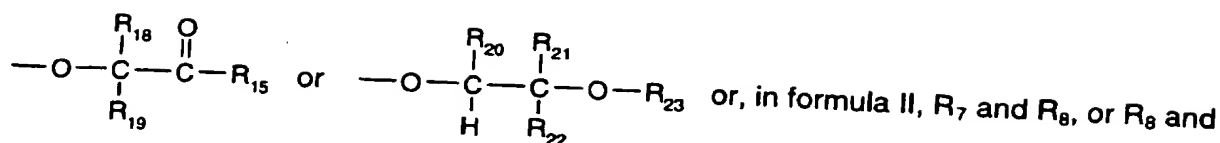
noylamino, C_3 - C_{25} alkenoyl; C_3 - C_{25} alkenoyl which is interrupted by oxygen, sulfur or

$\text{>N}-R_{14}$; C_3 - C_{25} alkenoyloxy; C_3 - C_{25} alkenoyloxy which is interrupted by oxygen, sulfur or

$\text{>N}-R_{14}$; C_6 - C_9 cycloalkylcarbonyl, C_6 - C_9 cycloalkylcarbonyloxy, benzoyl or C_1 - C_{12} alkyl-

substituted benzoyl; benzoyloxy or C_1 - C_{12} alkyl-substituted benzoyloxy;

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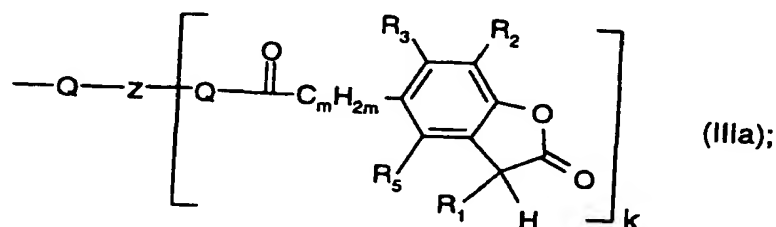


R_{11} , together with the linking carbon atoms, form a benzene ring,

R_{12} and R_{13} are each independently of the other unsubstituted or C_1 - C_4 alkyl-substituted phenylene or naphthylene,

R_{14} is hydrogen or C_1 - C_8 alkyl,

R_{15} is hydroxy, $\left[-O^- \frac{1}{r} M^{r+}\right]$, C_1 - C_{20} alkoxy, $-N \begin{smallmatrix} R_{24} \\ R_{25} \end{smallmatrix}$, or a group of the formula IIIa



R_{16} and R_{17} are each independently of the other hydrogen, CF_3 , C_1 - C_{12} alkyl or phenyl, or R_{16} and R_{17} , together with the linking carbon atom, are a C_5 - C_8 cycloalkylidene ring which is unsubstituted or substituted by 1 to 3 C_1 - C_4 alkyl;

R_{18} and R_{19} are each independently of the other hydrogen, C_1 - C_4 alkyl or phenyl,

R_{20} is hydrogen or C_1 - C_4 alkyl,

R_{21} is hydrogen, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; C_1 - C_{25} alkyl; C_2 - C_{25} alkyl

which is interrupted by oxygen, sulfur or $\text{---}N\text{---}R_{14}$; C_7 - C_9 phenylalkyl which is unsubsti-

tuted or substituted at the phenyl moiety by 1 to 3 C_1 - C_4 alkyl; C_7 - C_{25} phenylalkyl which is

interrupted by oxygen, sulfur or $\text{---}N\text{---}R_{14}$ and which is unsubstituted or substituted at the

phenyl moiety by 1 to 3 C_1 - C_4 alkyl, or R_{20} and R_{21} , together with the linking carbon atoms, form a C_5 - C_{12} cycloalkylene ring which is unsubstituted or substituted by 1 to 3 C_1 - C_4 alkyl;

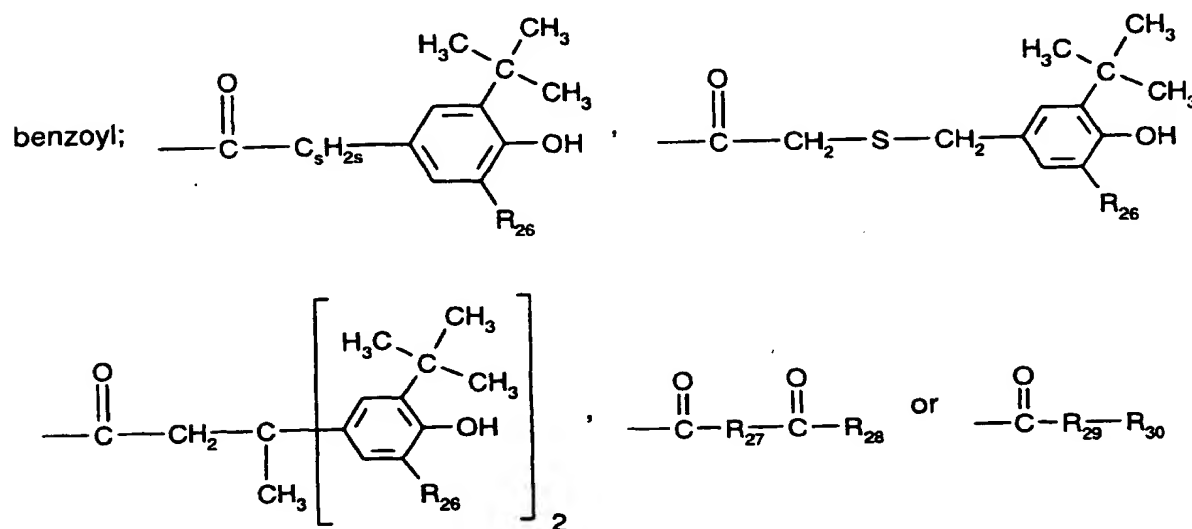
R_{22} is hydrogen or C_1 - C_4 alkyl,

R_{23} is hydrogen, C_1 - C_{25} alkanoyl, C_3 - C_{25} alkenoyl; C_3 - C_{25} alkanoyl which is interrupted by

oxygen, sulfur or $\text{---}N\text{---}R_{14}$; C_2 - C_{25} alkanoyl which is substituted by a di(C_1 - C_6 alkyl)phos-

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phonate group; C₆-C₉cycloalkylcarbonyl, thenoyl, furoyl, benzoyl or C₁-C₁₂alkyl-substituted



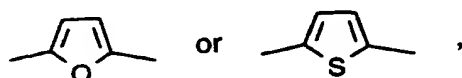
R₂₄ and R₂₅ are each independently of the other hydrogen or C₁-C₁₈alkyl,

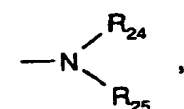
R₂₆ is hydrogen or C₁-C₈alkyl,

R₂₇ is a direct bond, C₁-C₁₈alkylene; C₂-C₁₈alkylene which is interrupted by oxygen, sulfur or

 N—R₁₄ ; C₂-C₁₈alkenylene, C₂-C₂₀alkylidene, C₇-C₂₀phenylalkylidene, C₅-C₈cycloalky-

lene, C₇-C₈bicycloalkylene, unsubstituted or C₁-C₄alkyl-substituted phenylene,



R₂₈ is hydroxy, $\left[-O^- \frac{1}{r} M^{r+} \right]$, C₁-C₁₈alkoxy or  ,

R₂₉ is oxygen or -NH-,

R₃₀ is C₁-C₁₈alkyl or phenyl,

R₃₁ is hydrogen or C₁-C₁₈alkyl,

M is an r-valent metal cation,

Q is oxygen or -NH-,

X is a direct bond, oxygen, sulfur or -NR₃₁- ,

Z is a linking group of valency (k+1) and is as a divalent group C₂-C₁₂alkylene, Q-interrupted C₄-C₁₂alkylene, phenylene or phenylene-D-phenylene with D being C₁-C₄alkylene, O, S, SO or SO₂;

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Z as a trivalent group is C_3 - C_{12} alkanetriyl, a trivalent residue of a hexose or a hexitol, a group $(-CH_2)_3C-CH_2OH$, or a group $-C_aH_{2a}-N(C_bH_{2b})-C_cH_{2c}-$; and

Z as a tetravalent group is a tetravalent residue of a hexose or a hexitol, C_4 - C_{12} alkaneteteryl,



a, b, c and k independently are 1, 2 or 3;

m is 0 or a number from the range 1-12, preferably 1-6;

n is 1 or 2;

q is 1, 2, 3, 4, 5 or 6;

r is 1, 2 or 3; and

s is 0, 1 or 2;

provided that, when R_7 is hydroxy, alkanoyloxy or alkanoyloxy interrupted by O, S or $N(R_{14})$ and R_9 is hydrogen, R_{10} is not identical with R_4 ; and when R_9 is hydroxy, alkanoyloxy or alkanoyloxy interrupted by O, S or $N(R_{14})$ and R_7 is hydrogen, R_8 is not identical with R_4 .

R_1 is preferably a radical of formula II. These preferred compounds of formula I advantageously carry at least one hydrocarbon or substituted hydrocarbon radical R_2 , R_3 , R_4 , R_5 , R_7 , R_8 , R_9 , R_{10} and/or R_{11} , where the total number of carbon atoms in all radicals together is at least 3. More preferred compounds comprise one or more substituents among R_2 - R_5 and R_7 - R_{11} , wherein the total number of carbon atoms in all substituents together is 4-35, especially 7-30.

Further objects of the invention are the use of a compound of the formula I in colour photographic material, especially as Dox-scavenger, and a photographic material containing a compound of the formula I, especially as herein defined below, e.g. of formula IV.

Preferred residues of the classes naphthyl, phenanthryl, anthryl, 5,6,7,8-tetrahydro-2-naphthyl, 5,6,7,8-tetrahydro-1-naphthyl, thienyl, benzo[b]thienyl, naphtho[2,3-b]thienyl, thianthrenyl, dibenzofuryl, chromenyl, xanthenyl, phenoxathiinyl, pyrrolyl, imidazolyl, pyrazolyl, pyrazinyl, pyrimidinyl, pyridazinyl, indiziny, isoindolyl, indolyl, indazolyl, purinyl, quinoliziny, isoquinolyl, quinolyl, phthalazinyl, naphthyridinyl, quinoxaliny, quinazolinyl,

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cinnoliny, pteridiny, carbazoly, β -carboliny, phenanthridiny, acridiny, perimidiny, phenanthroliny, phenaziny, isothiazoly, phenothiaziny, isoxazoly, furazany, bipheny, terpheny, fluoreny or phenoxaziny, each of which is unsubstituted or substituted by C_1 - C_4 alkyl, C_1 - C_4 alkoxy, C_1 - C_4 alkylthio, hydroxy, halogen, amino, C_1 - C_4 alkylamino, phenylamino or di(C_1 - C_4 alkyl)amino are, for example, 1-naphthyl, 2-naphthyl, 1-phenylamino-4-naphthyl, 1-methylnaphthyl, 2-methylnaphthyl, 1-methoxy-2-naphthyl, 2-methoxy-1-naphthyl, 1-dimethylamino-2-naphthyl, 1,2-dimethyl-4-naphthyl, 1,2-dimethyl-6-naphthyl, 1,2-dimethyl-7-naphthyl, 1,3-dimethyl-6-naphthyl, 1,4-dimethyl-6-naphthyl, 1,5-dimethyl-2-naphthyl, 1,6-dimethyl-2-naphthyl, 1-hydroxy-2-naphthyl, 2-hydroxy-1-naphthyl, 1,4-dihydroxy-2-naphthyl, 7-phenanthryl, 1-anthryl, 2-anthryl, 9-anthryl, 3-benzo[b]thienyl, 5-benzo[b]thienyl, 2-benzo[b]thienyl, 4-dibenzofuryl, 4,7-dibenzofuryl, 4-methyl-7-dibenzofuryl, 2-xanthenyl, 8-methyl-2-xanthenyl, 3-xanthenyl, 2-pyrrolyl, 3-pyrrolyl, 2-phenothiaziny, 3-phenothiaziny, 10-methyl-3-phenothiaziny.

Halogen is typically chloro, bromo or iodo. Chloro is preferred.

Alkanoyl of up to 25 carbon atoms is a branched or unbranched radical, typically formyl, acetyl, propionyl, butanoyl, pentanoyl, hexanoyl, heptanoyl, octanoyl, nonanoyl, decanoyl, undecanoyl, dodecanoyl, tridecanoyl, tetradecanoyl, pentadecanoyl, hexadecanoyl, heptadecanoyl, octadecanoyl, eicosanoyl or docosanoyl. Alkanoyl of 2 to 18, in particular of 2 to 12, e.g. of 2 to 6, carbon atoms is preferred. Acetyl is particularly preferred. C_2 - C_{25} Alkanoyl which is substituted by a di(C_1 - C_6 alkyl)phosphonate group is typically $(CH_3CH_2O)_2POCH_2CO-$, $(CH_3O)_2POCH_2CO-$, $(CH_3CH_2CH_2CH_2O)_2POCH_2CO-$, $(CH_3CH_2O)_2POCH_2CH_2CO-$, $(CH_3O)_2POCH_2CH_2CO-$, $(CH_3CH_2CH_2CH_2O)_2POCH_2CH_2CO-$, $(CH_3CH_2O)_2PO(CH_2)_4CO-$, $(CH_3CH_2O)_2PO(CH_2)_8CO-$ or $(CH_3CH_2O)_2PO(CH_2)_{17}CO-$. C_3 - C_{25} Alkanoyl which is interrupted

by oxygen, sulfur or $\text{N}-R_{14}$ is typically CH_3-O-CH_2CO- , CH_3-S-CH_2CO- ,

$CH_3-NH-CH_2CO-$, $CH_3-N(CH_3)-CH_2CO-$, $CH_3-O-CH_2CH_2-O-CH_2CO-$, $CH_3-(O-CH_2CH_2)_2O-CH_2CO-$, $CH_3-(O-CH_2CH_2)_3O-CH_2CO-$ or $CH_3-(O-CH_2CH_2)_4O-CH_2CO-$.

Alkanoyloxy is oxygen-capped alkanoyl; preferences are mainly as can be derived from alkanoyl above.

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Alkenoyl of 3 to 25 carbon atoms is a branched or unbranched radical, typically propenoyl, 2-butenoyl, 3-butenoyl, isobutenoyl, n-2,4-pentadienoyl, 3-methyl-2-butenoyl, n-2-octenoyl, n-2-dodecenoyl, isododecenoyl, oleoyl, n-2-octadecenoyl or n-4-octadecenoyl. Alkenoyl of 3 to 18, preferably of 3 to 12, e.g. of 3 to 6, most preferably of 3 to 4, carbon atoms is preferred.

C₃-C₂₅Alkenoyl which is interrupted by oxygen, sulfur or >N-R_{14} is typically

CH₃OCH₂CH₂CH=CHCO- or CH₃OCH₂CH₂OCH=CHCO-.

Alkenoyloxy is oxygen-capped alkenoyl; preferences are mainly as can be derived from alkenoyl above.

C₆-C₉Cycloalkylcarbonyl is typically cyclohexylcarbonyl, cycloheptylcarbonyl or cyclooctylcarbonyl. Cyclohexylcarbonyl is preferred. C₆-C₉Cycloalkylcarbonyloxy is oxygen-capped cycloalkylcarbonyl; preferences are analogous.

C₁-C₁₂Alkyl-substituted benzoyl which preferably carries 1 to 3, more preferably 1 or 2, alkyl groups is typically o-, m- or p-methylbenzoyl, 2,3-dimethylbenzoyl, 2,4-dimethylbenzoyl, 2,5-dimethylbenzoyl, 2,6-dimethylbenzoyl, 3,4-dimethylbenzoyl, 3,5-dimethylbenzoyl, 2-methyl-6-ethylbenzoyl, 4-tert-butylbenzoyl, 2-ethylbenzoyl, 2,4,6-trimethylbenzoyl, 2,6-dimethyl-4-tert-butylbenzoyl or 3,5-di-tert-butylbenzoyl. Preferred substituents are C₁-C₈alkyl, in particular C₁-C₄alkyl.

C₁-C₁₂Alkyl-substituted benzoyloxy which preferably carries 1 to 3, more preferably 1 or 2, alkyl groups is typically o-, m- or p-methylbenzoyloxy, 2,3-dimethylbenzoyloxy, 2,4-dimethylbenzoyloxy, 2,5-dimethylbenzoyloxy, 2,6-dimethylbenzoyloxy, 3,4-dimethylbenzoyloxy, 3,5-dimethylbenzoyloxy, 2-methyl-6-ethylbenzoyloxy, 4-tert-butylbenzoyloxy, 2-ethylbenzoyloxy, 2,4,6-trimethylbenzoyloxy, 2,6-dimethyl-4-tert-butylbenzoyloxy or 3,5-di-tert-butylbenzoyloxy. Preferred substituents are C₁-C₈alkyl, in particular C₁-C₄alkyl.

Alkyl of up to 25 carbon atoms is a branched or unbranched radical, such as methyl, ethyl, propyl, isopropyl, n-butyl, sec-butyl, isobutyl, tert-butyl, 2-ethylbutyl, n-pentyl, isopentyl, 1-methylpentyl, 1,3-dimethylbutyl, n-hexyl, 1-methylhexyl, n-heptyl, isoheptyl, 1,1,3,3-tetramethylbutyl, 1-methylheptyl, 3-methylheptyl, n-octyl, 2-ethylhexyl, 1,1,3-trimethylhexyl, 1,1,3,3-tetramethylpentyl, nonyl, decyl, undecyl, 1-methylundecyl, dodecyl, 1,1,3,3,5,5-hexamethylhexyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, eicosyl or do-

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cosyl. One of the preferred meanings of R_2 and R_4 is, for example, C_1 - C_{18} alkyl. A particularly preferred meaning of R_4 is C_1 - C_4 alkyl. One of R_2 and R_4 is preferably a branched radical; especially preferred are both R_2 and R_4 branched radicals.

Alkenyl of 3 to 25 carbon atoms is a branched or unbranched radical, such as propenyl, 2-butenyl, 3-butenyl, isobutenyl, n-2,4-pentadienyl, 3-methyl-2-butenyl, n-2-octenyl, n-2-dodecenyl, isododecenyl, oleyl, n-2-octadecenyl or n-4-octadecenyl. Alkenyl of 3 to 18, preferably of 3 to 12, e.g. of 3 to 6, in particular of 3 to 4, carbon atoms is preferred.

Alkenyloxy is oxygen capped alkenyl; preferences are analogous.

Alkynyl of 3 to 25 carbon atoms is a branched or unbranched radical, such as propynyl ($-\text{CH}_2-\text{C}\equiv\text{CH}$), 2-butylnyl, 3-butylnyl, n-2-octynyl, or n-2-dodecynyl. Alkynyl of 3 to 18, preferably of 3 to 12, e.g. of 3 to 6, in particular of 3 to 4 carbon atoms is preferred. Preferences for alkynyloxy (oxygen capped alkynyl) are analogous.

C_2 - C_{25} Alkyl which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$ is typically

$\text{CH}_3\text{-O-CH}_2\text{-}$, $\text{CH}_3\text{-S-CH}_2\text{-}$, $\text{CH}_3\text{-NH-CH}_2\text{-}$, $\text{CH}_3\text{-N(CH}_3\text{)-CH}_2\text{-}$, $\text{CH}_3\text{-O-CH}_2\text{CH}_2\text{-O-CH}_2\text{-}$,
 $\text{CH}_3\text{-(O-CH}_2\text{CH}_2\text{)}_2\text{-O-CH}_2\text{-}$, $\text{CH}_3\text{-(O-CH}_2\text{CH}_2\text{)}_3\text{-O-CH}_2\text{-}$ or $\text{CH}_3\text{-(O-CH}_2\text{CH}_2\text{)}_4\text{-O-CH}_2\text{-}$.

C_7 - C_9 Phenylalkyl is typically benzyl, α -methylbenzyl, α,α -dimethylbenzyl or 2-phenylethyl. Benzyl and α,α -dimethylbenzyl are preferred.

C_7 - C_9 Phenylalkyl which is unsubstituted or substituted at the phenyl moiety by 1 to 3 C_1 - C_4 -alkyl is typically benzyl, α -methylbenzyl, α,α -dimethylbenzyl, 2-phenylethyl, 2-methylbenzyl, 3-methylbenzyl, 4-methylbenzyl, 2,4-dimethylbenzyl, 2,6-dimethylbenzyl or 4-tert-butylbenzyl. Benzyl is preferred.

C_7 - C_{25} Phenylalkyl which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$ and which is unsubstituted or substituted at the phenyl moiety by 1 to 3 C_1 - C_4 alkyl is a branched or unbranched

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radical, such as phenoxymethyl, 2-methylphenoxymethyl, 3-methyl-phenoxymethyl, 4-methylphenoxymethyl, 2,4-dimethylphenoxymethyl, 2,3-dimethylphenoxymethyl, phenylthiomethyl, N-methyl-N-phenyl-methyl, N-ethyl-N-phenylmethyl, 4-tert-butylphenoxymethyl, 4-tert-butylphenoxyethoxymethyl, 2,4-di-tert-butylphenoxymethyl, 2,4-di-tert-butylphenoxyethoxymethyl, phenoxyethoxyethoxyethoxymethyl, benzyloxymethyl, benzyloxyethoxymethyl, N-benzyl-N-ethylmethyl or N-benzyl-N-isopropylmethyl.

C₇-C₉Phenylalkoxy is typically benzyloxy, α -methylbenzyloxy, α,α -dimethylbenzyloxy or 2-phenylethoxy. Benzyloxy is preferred.

C₁-C₄Alkyl-substituted phenyl which preferably contains 1 to 3, in particular 1 or 2, alkyl groups is typically o-, m- or p-methylphenyl, 2,3-dimethylphenyl, 2,4-dimethylphenyl, 2,5-dimethylphenyl, 2,6-dimethylphenyl, 3,4-dimethylphenyl, 3,5-dimethylphenyl, 2-methyl-6-ethylphenyl, 4-tert-butylphenyl, 2-ethylphenyl or 2,6-diethylphenyl.

C₁-C₄Alkyl-substituted phenoxy which preferably contains 1 to 3, in particular 1 or 2, alkyl groups is typically o-, m- or p-methylphenoxy, 2,3-dimethylphenoxy, 2,4-dimethylphenoxy, 2,5-dimethylphenoxy, 2,6-dimethylphenoxy, 3,4-dimethylphenoxy, 3,5-dimethylphenoxy, 2-methyl-6-ethylphenoxy, 4-tert-butylphenoxy, 2-ethylphenoxy or 2,6-diethylphenoxy.

Unsubstituted or C₁-C₄alkyl-substituted C₅-C₈cycloalkyl is, for example, cyclopentyl, methylcyclopentyl, dimethylcyclopentyl, cyclohexyl, methylcyclohexyl, dimethylcyclohexyl, trimethylcyclohexyl, tert-butylcyclohexyl, cycloheptyl or cyclooctyl. Cyclohexyl and tert-butylcyclohexyl are preferred.

Unsubstituted or C₁-C₄alkyl-substituted C₅-C₈cycloalkoxy is, for example, cyclopentoxy, methylcyclopentoxy, dimethylcyclopentoxy, cyclohexoxy, methylcyclohexoxy, dimethylcyclohexoxy, trimethylcyclohexoxy, tert-butylcyclohexoxy, cycloheptoxy or cyclooctoxy. Cyclohexoxy, and tert-butylcyclohexoxy are preferred.

Alkoxy of up to 25 carbon atoms is a branched or unbranched radical, such as methoxy, ethoxy, propoxy, isopropoxy, n-butoxy, isobutoxy, pentoxy, isopentoxy, hexoxy, heptoxy, octoxy, decyloxy, tetradecyloxy, hexadecyloxy or octadecyloxy. Alkoxy of 1 to 12, in particular of 1 to 8, e.g. of 1 to 6, carbon atoms is preferred.

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C₂-C₂₅Alkoxy which is interrupted by oxygen, sulfur or >N-R_{14} is typically

CH₃-O-CH₂CH₂O-, CH₃-S-CH₂CH₂O-, CH₃-NH-CH₂CH₂O-, CH₃-N(CH₃)-CH₂CH₂O-,
 CH₃-O-CH₂CH₂-O-CH₂CH₂O-, CH₃-(O-CH₂CH₂)₂O-CH₂CH₂O-,
 CH₃-(O-CH₂CH₂)₃O-CH₂CH₂O- or CH₃-(O-CH₂CH₂)₄O-CH₂CH₂O-.

Alkylthio of up to 25 carbon atoms is a branched or unbranched radical, such as methylthio, ethylthio, propylthio, isopropylthio, n-butylthio, isobutylthio, pentylthio, isopentylthio, hexylthio, heptylthio, octylthio, decylthio, tetradecylthio, hexadecylthio or octadecylthio. Alkylthio of 1 to 12, in particular of 1 to 8, e.g. of 1 to 6 carbon atoms is preferred.

Alkylamino of up to 4 carbon atoms is a branched or unbranched radical, such as methylamino, ethylamino, propylamino, isopropylamino, n-butylamino, isobutylamino or tert-butylamino.

Di(C₁-C₄alkyl)amino also means that the two radicals are independently of the other branched or unbranched, such as dimethylamino, methylethylamino, diethylamino, methyl-n-propylamino, methylisopropylamino, methyl-n-butylamino, methylisobutylamino, ethylisopropylamino, ethyl-n-butylamino, ethylisobutylamino, ethyl-tert-butylamino, diethylamino, diisopropylamino, isopropyl-n-butylamino, isopropylisobutylamino, di-n-butylamino or di-isobutylamino.

Alkanoylamino of up to 25 carbon atoms is a branched or unbranched radical, such as formylamino, acetylamino, propionylamino, butanoylamino, pentanoylamino, hexanoylamino, heptanoylamino, octanoylamino, nonanoylamino, decanoylamino, undecanoylamino, dodecanoylamino, tridecanoylamino, tetradecanoylamino, pentadecanoylamino, hexadecanoylamino, heptadecanoylamino, octadecanoylamino, eicosanoylamino or docosanoylamino.* Alkanoylamino of 2 to 18, in particular of 2 to 12, e.g. of 2 to 6, carbon atoms is preferred.

C₁-C₁₈Alkylene is a branched or unbranched radical, such as methylene, ethylene, propylene, trimethylene, tetramethylene, pentamethylene, hexamethylene, heptamethylene, octamethylene, decamethylene, dodecamethylene or octadecamethylene. C₁-C₁₂Alkylene and, in particular, C₁-C₈alkylene are preferred.

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A C₁-C₄Alkyl-substituted C₅-C₁₂cycloalkylene ring which preferably contains 1 to 3, in particular 1 or 2, branched or unbranched alkyl groups is typically cyclopentylene, methylcyclopentylene, dimethylcyclopentylene, cyclohexylene, methylcyclohexylene, dimethylcyclohexylene, trimethylcyclohexylene, tert-butylcyclohexylene, cycloheptylene, cyclooctylene or cyclodecylene. Cyclohexylene and tert-butylcyclohexylene are preferred.

C₂-C₁₈Alkylene which is interrupted by oxygen, sulfur or $\text{N}-\text{R}_{14}$ is, for example,

-CH₂-O-CH₂-, -CH₂-S-CH₂-, -CH₂-NH-CH₂-, -CH₂-N(CH₃)-CH₂-, -CH₂-O-CH₂CH₂-O-CH₂-,
 -CH₂-(O-CH₂CH₂)₂-O-CH₂-, -CH₂-(O-CH₂CH₂)₃-O-CH₂-, -CH₂-(O-CH₂CH₂)₄-O-CH₂- or
 -CH₂CH₂-S-CH₂CH₂-.

C₂-C₁₈Alkenylene is typically vinylene, methylvinylene, octenylethylene or dodecenylethylene. C₂-C₈Alkenylene is preferred.

Alkylidene of 2 to 20 carbon atoms is, for example, ethylidene, propylidene, butylidene, pentylidene, 4-methylpentylidene, heptylidene, nonylidene, tridecylidene, nonadecylidene, 1-methylethylidene, 1-ethylpropylidene or 1-ethylpentylidene. C₂-C₈Alkylidene is preferred.

Phenylalkylidene of 7 to 20 carbon atoms is typically benzylidene, 2-phenylethylidene or 1-phenyl-2-hexylidene. C₇-C₉Phenylalkylidene is preferred.

C₅-C₈Cycloalkylene is a saturated hydrocarbon group having two free valencies and at least one ring unit and is typically cyclopentylene, cyclohexylene, cycloheptylene or cyclooctylene. Cyclohexylene is preferred.

C₇-C₈Bicycloalkylene is typically bicycloheptylene or bicyclooctylene.

Unsubstituted or C₁-C₄alkyl-substituted phenylene or naphthylene is typically 1,2-, 1,3-, 1,4-phenylene, 1,2-, 1,3-, 1,4-, 1,6-, 1,7-, 2,6- or 2,7-naphthylene. 1,4-Phenylene is preferred.

A C₁-C₄alkyl-substituted C₅-C₈cycloalkylidene ring which preferably contains 1 to 3, in particular 1 or 2, branched or unbranched alkyl groups is typically cyclopentylidene, methylcyclo-

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pentylidene, dimethylcyclopentylidene, cyclohexylidene, methylcyclohexylidene, dimethylcyclohexylidene, trimethylcyclohexylidene, tert-butylcyclohexylidene, cycloheptylidene or cyclooctylidene. Cyclohexylidene and tert-butylcyclohexylidene are preferred.

A mono-, di- or tri-valent metal cation is preferably an alkali metal cation, alkaline earth metal cation or aluminium cation, typically Na^+ , K^+ , Mg^{++} , Ca^{++} or Al^{+++} .

Preferred are compositions containing a compound of formula I, wherein

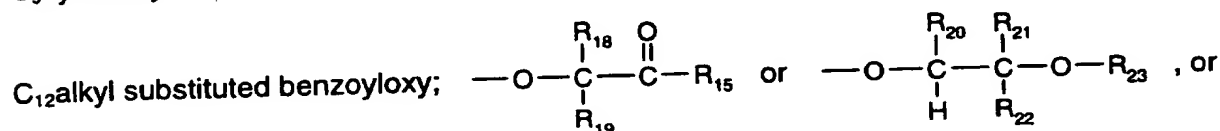
R_2 , R_3 and R_5 , independently, are H, Cl, hydroxy, $\text{C}_1\text{-C}_{25}$ alkyl, $\text{C}_7\text{-C}_9$ phenylalkyl, unsubstituted or $\text{C}_1\text{-C}_4$ alkyl-substituted phenyl; $\text{C}_1\text{-C}_{18}$ alkoxy, $\text{C}_1\text{-C}_{25}$ alkanoyloxy,

$\text{C}_3\text{-C}_{25}$ alkenoyloxy; and where

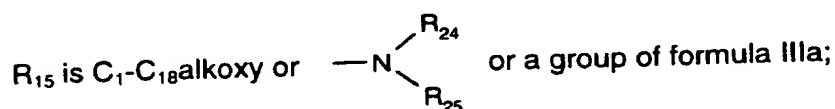
R_4 is Cl, hydroxy, $\text{C}_1\text{-C}_{25}$ alkyl, $\text{C}_7\text{-C}_9$ phenylalkyl, unsubstituted or $\text{C}_1\text{-C}_4$ alkyl-substituted phenyl; $\text{C}_1\text{-C}_{18}$ alkoxy, $\text{C}_1\text{-C}_{25}$ alkanoyloxy, $\text{C}_3\text{-C}_{25}$ alkenoyloxy or is a group $-\text{C}_m\text{H}_{2m}-\text{COR}_{15}$, or where R_3 , R_5 and R_6 are H, R_4 may be a residue of formula III, or where R_8 or R_{10} are other than H, R_4 may also be hydrogen;

R_6 is H,

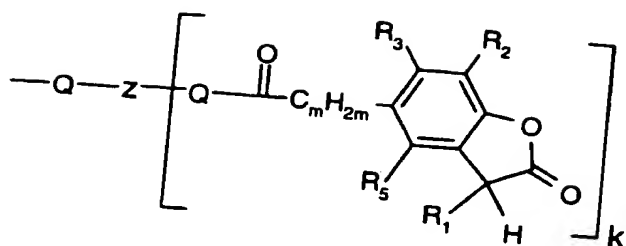
R_7 , R_8 , R_9 , R_{10} and R_{11} independently are H, halogen, hydroxy, $\text{C}_1\text{-C}_{25}$ alkyl, O interrupted $\text{C}_2\text{-C}_{25}$ alkyl; $\text{C}_1\text{-C}_{25}$ alkoxy, O interrupted $\text{C}_2\text{-C}_{25}$ alkoxy, $\text{C}_3\text{-C}_{25}$ alkenyl, $\text{C}_3\text{-C}_{25}$ alkenoyloxy, $\text{C}_7\text{-C}_9$ phenylalkyl, $\text{C}_7\text{-C}_9$ phenylalkoxy, unsubstituted or $\text{C}_1\text{-C}_4$ alkyl-substituted phenyl; unsubstituted or $\text{C}_1\text{-C}_4$ alkyl substituted phenoxy; unsubstituted or $\text{C}_1\text{-C}_4$ alkyl substituted $\text{C}_5\text{-C}_8$ cycloalkyl; unsubstituted or $\text{C}_1\text{-C}_4$ alkyl substituted $\text{C}_5\text{-C}_8$ cycloalkoxy; $\text{C}_1\text{-C}_4$ alkylamino, di- $(\text{C}_1\text{-C}_4\text{-alkyl})$ amino, $\text{C}_1\text{-C}_{25}$ alkanoyl; $\text{C}_1\text{-C}_{25}$ alkanoyloxy; $\text{C}_6\text{-C}_9$ cycloalkylcarbonyl, $\text{C}_6\text{-C}_9$ cycloalkylcarbonyloxy, benzoyl or $\text{C}_1\text{-C}_{12}$ alkyl-substituted benzoyl; benzoyloxy or $\text{C}_1\text{-C}_{12}$ alkyl substituted benzoyloxy;



where in formula II R_7 and R_8 or R_8 and R_{11} together with the carbon atoms, they are bonded to, form a phenyl ring;



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(IIIa);

R_{16} and R_{17} independently are H, CF_3 , C_1 - C_{12} alkyl or phenyl; or R_{16} and R_{17} together with the bonding carbon atom form an unsubstituted or 1-3 C_1 - C_4 alkyl-substituted C_5 - C_8 cycloalkylidene ring;

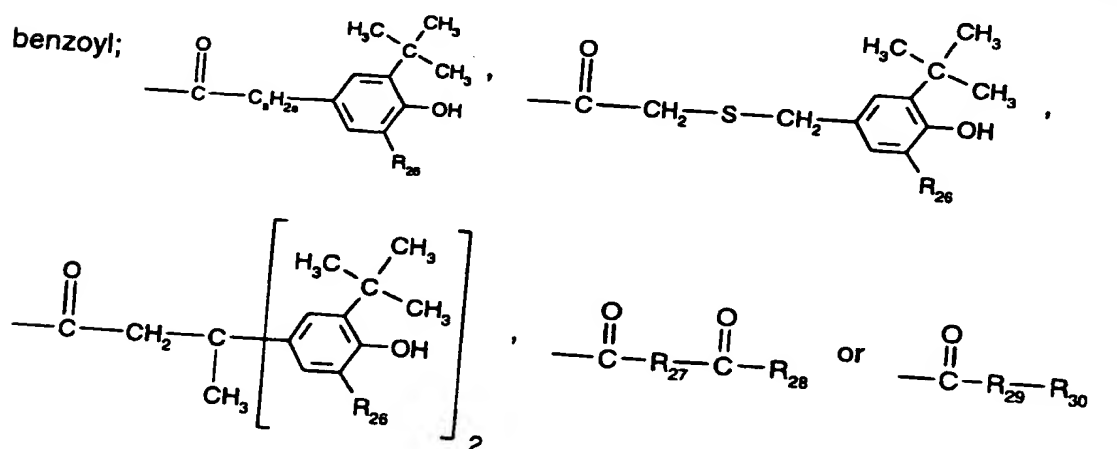
R_{18} and R_{19} independently are H, C_1 - C_4 alkyl or phenyl;

R_{20} is H or C_1 - C_4 alkyl;

R_{21} is H, unsubstituted or C_1 - C_4 alkyl substituted phenyl; C_1 - C_{25} alkyl, unsubstituted or on the phenyl ring 1-3 C_1 - C_4 alkyl-substituted C_7 - C_9 phenylalkyl;

R_{22} is H or C_1 - C_4 alkyl;

R_{23} is H, C_1 - C_{25} alkanoyl, C_3 - C_{25} alkenoyl; di(C_1 - C_6 alkyl)phosphonate-substituted C_2 - C_{25} alkanoyl; C_6 - C_9 cycloalkylcarbonyl, thenoyl, furoyl, benzoyl or C_1 - C_{12} alkyl-substituted



R_{24} and R_{25} independently are H or C_1 - C_{18} alkyl;

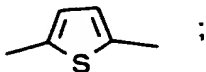
R_{26} is H or C_1 - C_8 alkyl;

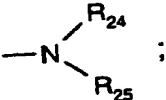
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R_{27} is a direct bond, C_1 - C_{18} alkylen, C_2 - C_{18} alkenylen, C_7 - C_{20} phenylalkyliden, C_5 -

C_8 cycloalkylen, unsubstituted or C_1 - C_4 alkyl-substituted phenylene,  or



R_{28} C_1 - C_{18} alkoxy or  ;

R_{29} is O or -NH-;

R_{30} C_1 - C_{18} alkyl or phenyl;

M a metal cation of the valency r ;

X a direct bond, O, S or - NR_{31} ;

n 1 or 2;

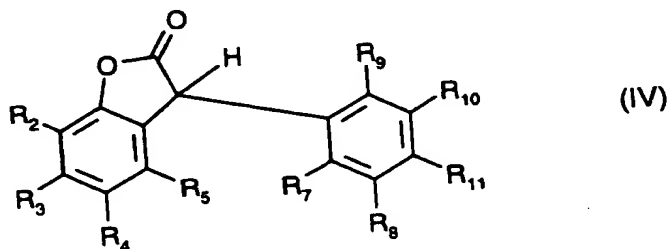
m is a number from the range 1-8;

q 1, 2, 3, 4, 5 or 6;

r 1, 2 or 3; and

s is 0, 1 or 2.

More preferred for use according to present invention is a compound of the formula IV



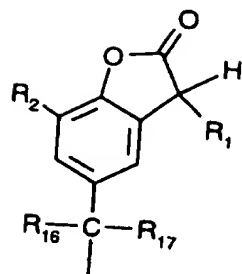
wherein

R_2 is H or C_1 - C_{20} alkyl;

R_3 is H or C_1 - C_{18} alkyl;

R_4 is C_1 - C_8 alkyl, H, C_1 - C_6 alkoxy or a group - C_mH_{2m} -COR₁₅ or a group of the formula III

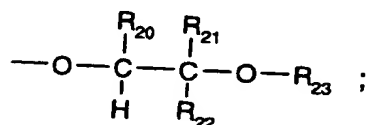
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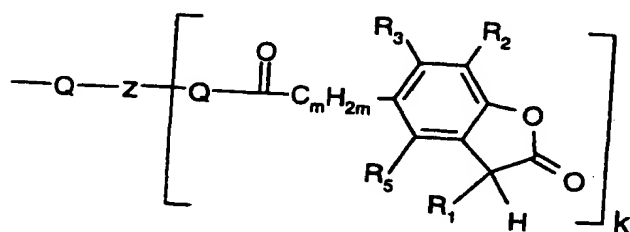
(III);

R_5 is H or C_1 - C_{18} alkyl;

R_7, R_8, R_9, R_{10} and R_{11} independently are H, OH, chloro, C_1 - C_{18} alkyl, C_1 - C_{18} alkoxy, di(C_1 - C_4 alkyl)amino, phenyl, C_2 - C_{18} alkanoyloxy, C_3 - C_{18} -alkoxycarbonylalkoxy or



especially wherein at least 2 of the residues $R_7, R_8, R_9, R_{10}, R_{11}$ are H;
 R_{15} is C_1 - C_{18} alkoxy or a group of the formula IIIa

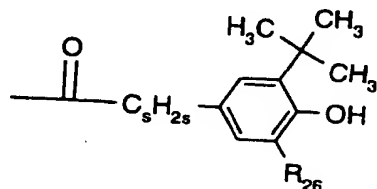


(IIIa);

R_{16} and R_{17} independently are H, C_1 - C_{12} alkyl or phenyl; or R_{16} and R_{17} together with the bonding carbon atom form a C_5 - C_8 cycloalkylidene ring;

R_{20}, R_{21} and R_{22} independently are H or C_1 - C_4 alkyl;

R_{23} is H, C_2 - C_{18} alkanoyl or a group



R_{26} is C_1 - C_4 alkyl;

Q is oxygen;

Z is C_2 - C_{12} alkylene;

k is 1;

m is 1, 2, 3, 4, 5 or 6 and

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s is 0, 1 or 2.

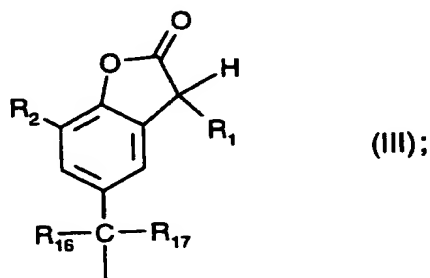
R_4 is preferably not H, most preferably not H and not OH. Especially preferred is a compound wherein R_4 is C_1 - C_6 alkyl, especially tertiary C_4 - C_6 alkyl, or a group $-C_mH_{2m}-COR_{15}$ or a group of the formula III.

Most preferred for use according to present invention is a compound of the formula IV wherein

R_2 is C_1 - C_{20} alkyl;

R_3 is H or C_1 - C_{18} alkyl;

R_4 is C_1 - C_6 alkyl, C_1 - C_6 alkoxy or a group $-C_mH_{2m}-COR_{15}$ or a group of the formula III



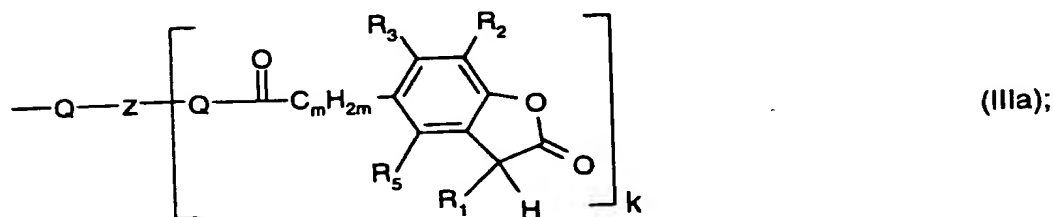
R_5 is H or C_1 - C_{18} alkyl;

R_7 and R_9 independently are H, chloro, C_1 - C_{18} alkyl;

R_8 , R_{10} and R_{11} independently are H, OH, chloro, C_1 - C_{18} alkyl, C_1 - C_{18} alkoxy, di(C_1 -

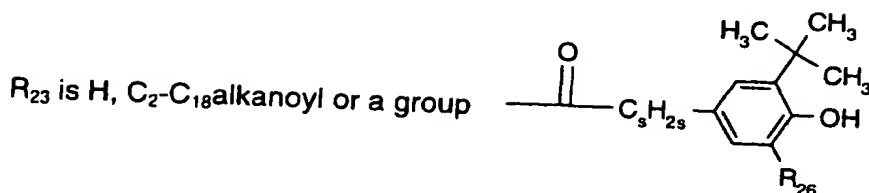
C_4 alkyl)amino, phenyl, C_2 - C_{18} alkanoyloxy or $-O-\begin{matrix} R_{20} & R_{21} \\ | & | \\ C & - & C & - & O-R_{23} \\ | & | \\ H & R_{22} \end{matrix}$;

R_{15} is C_1 - C_{18} alkoxy or a group of the formula IIIa



R_{20} , R_{21} and R_{22} are H;

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R_{26} is C_1 - C_4 alkyl;

Q is oxygen;

Z is C_2 - C_{12} alkylene;

k is 1;

m is 1, 2, 3, 4, 5 or 6 and

s is 0, 1 or 2.

Of special interest are those compounds of formula IV wherein R_7 is H and R_9 is H or methyl.

More interesting is a process where in the compound of formula I, if $n = 1$, R_1 is phenyl which is unsubstituted or substituted in para-position by C_1 - C_{18} alkylthio or di(C_1 - C_4 -alkyl)amino; mono- to penta-substituted alkylphenyl containing together a total of at most 18 carbon atoms in the 1 to 5 alkyl substituents; naphthyl, biphenyl, terphenyl, phenanthryl, anthryl, fluorenyl, carbazolyl, thienyl, pyrrolyl, phenothiazinyl or 5,6,7,8-tetrahydronaphthyl which are unsubstituted or substituted by C_1 - C_4 -alkyl, C_1 - C_4 alkoxy, C_1 - C_4 alkylthio, hydroxy or amino.

Also preferred compositions contain compounds of the formula I wherein the bonding atom in R_2 is a secondary or tertiary carbon atom, especially wherein R_2 is secondary C_6 - C_{22} alkyl or tertiary C_4 - C_{22} alkyl or phenyl or substituted phenyl or alkyl or alkoxy interrupted by COO; R_4 is secondary C_6 - C_{22} alkyl or tertiary C_4 - C_{22} alkyl or a group of formula III or alkyl or alkoxy interrupted by COO; and R_{11} is H or methyl or phenyl or alkyl or alkoxy interrupted by COO. Of special interest are compounds whose residues R_2 , R_4 or R_{11} contain an ester group.

Especially preferred are compounds of the formula IV wherein

R_2 is H or C_1 - C_{20} alkyl;

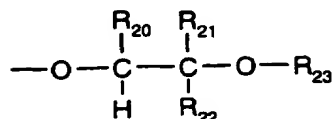
R_3 is H or C_1 - C_{18} alkyl;

R_4 is C_1 - C_6 alkyl, $-(CH_2)_p-COR_{15}$ or $-C(CH_3)_2-(CH_2)_p-COR_{15}$;

R_5 is H or C_1 - C_{18} alkyl;

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R_7, R_8, R_9, R_{10} and R_{11} independently are H, C_1 - C_{18} alkyl, C_1 - C_{18} alkoxy or



especially wherein at least 2 of the residues $R_7, R_8, R_9, R_{10}, R_{11}$ are H;

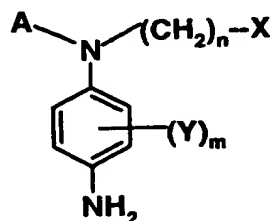
R_{15} is C_1 - C_{18} alkoxy;

R_{20}, R_{21} and R_{22} are H; and

p is 2 or 3.

Compounds of the formula I or IV can be obtained according to methods known in the art, e.g. as described in GB-A-2281910 or publications cited therein, or, like compounds of formula V, in analogy to those methods. Some compounds of the formula I are commercially available.

This class of lactones are preferably used to trap the oxidised form of a developer having the following general structure:



where $A = C_1$ - C_6 -Alkyl;

$n = 1 - 6$;

$X = \text{Hydrogen, Hydroxy, } C_1\text{-}C_8\text{-Alkoxy, } COR_{15}, N HSO_2 R_{30}$;

$Y = C_1$ - C_8 alkyl, C_1 - C_8 alkoxy, halogen; $m = 0 - 4$.

In the above structure the preferred substituents are $A = -CH_2CH_3$ and $n=2$,
 $X = \text{hydrogen or } -N HSO_2CH_3 \text{ or } -OH \text{ or } -OCH_3$, $Y = \text{hydrogen or } -CH_3$ and $m = 1$.

The photographic materials according to this invention comprise a support bearing at least one layer of a light-sensitive silver halide emulsion.

Examples of colour photographic materials according to this invention are colour negative films, colour reversal films, colour positive films, colour photographic paper, colour reversal

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photographic paper, colour-sensitive materials for the dye diffusion transfer process or the silver dye bleach process.

Of especial interest is a colour photographic recording material comprising, on a base, at least one blue-sensitive silver halide emulsion layer containing at least one yellow dye providing compound, at least one green-sensitive silver halide emulsion layer containing at least one magenta dye providing compound, at least one red-sensitive silver halide emulsion layer containing at least one cyan dye providing compound, and customary (non light sensitive) top layer(s) and interlayers separating the light-sensitive layers.

The layers of the colour photographic material can be arranged in various orders as is well known in the art.

The compound of the formula I or IV can be contained in any of the layers of the photographic material, i.e. in any of the light sensitive silver halide emulsion layers or in a non light sensitive layer. For use as a Dox scavenger, the compound of the formula I is preferably contained in one or more non light sensitive layers. In this case, the light sensitive layers may contain a lower concentration of the compound of the formula I or none.

In general, the compounds of the formula I or IV are contained in the photographic material in an amount from 10 to 1000 mg/m², especially from 30 to 500 mg/m².

The lactones of formula I or IV can be milled with polymers (e.g. PVS, polyester, polyvinyl alcohol etc.) and placed in a layer thus preventing its migration to adjacent layers. Also, the benzofuranones containing a suitable functional group (e.g. ester, hydroxy) can be reacted with a polymer, e.g. a polyvinyl alcohol or polyester, in order to attach them chemically. This form will reduce their migrating tendency.

Typical bases for the photographic material include polymeric films and paper (including polymer-coated paper). Details regarding supports and other layers of colour photographic recording materials can be found in Research Disclosure, Item 36544, September 1994.

Essential constituents of the photographic emulsion layers are binders, silver halide particles and colour couplers. Details regarding the constituents of the light sensitive layers and other

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(non light sensitive) layers such as top layers and interlayers separating the silver halide emulsion layers can be found in Research Disclosure, Item 38957, September 1996.

The invention therefore also pertains to a colour photographic material comprising a compound of the formula I or IV, and to the use of a compound of the formula I or IV as an additive in a colour photographic material.

Preferred compounds of the formula I or IV in the colour photographic material of the invention or the corresponding use are as described for the process of the invention.

Compounds of present invention are with special advantage when incorporated into photographic materials containing magenta couplers of the pyrazolotriazole class.

Examples for especially suitable yellow, magenta and cyan couplers to be used in combination with compounds of the present invention are given below:

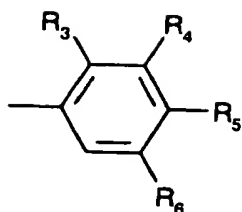
Yellow couplers which can be used in the novel material are preferably compounds of the formula A



in which R_1 is alkyl or aryl, R_2 is aryl and Q is hydrogen or a group which can be eliminated by reaction with the oxidized developer.

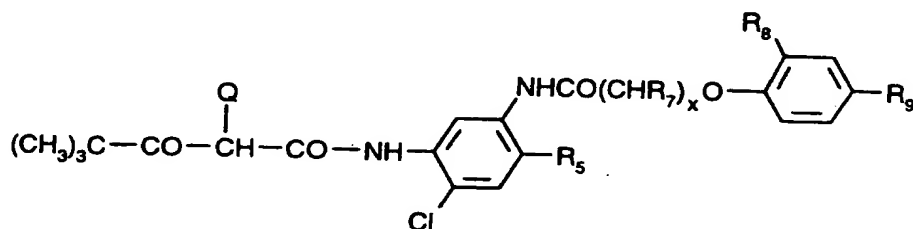
One group of yellow couplers comprises those compounds of the formula A in which R_1 is t-butyl and R_2 is a group of the formula

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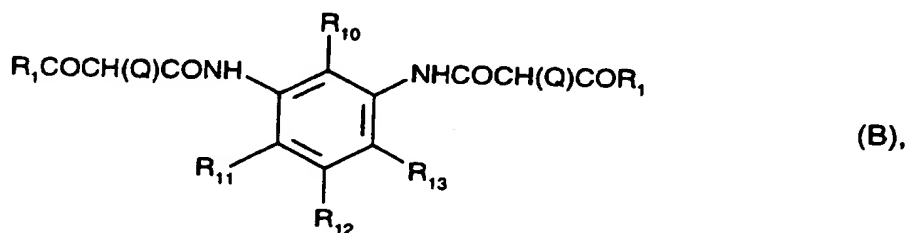
in which R₃ is hydrogen, halogen, alkyl or alkoxy and R₄, R₅ and R₆ are hydrogen, halogen, alkyl, alkenyl, alkoxy, aryl, carboxyl, alkoxycarbonyl, a carbamoyl group, a sulfonyl or sulfamoyl group, an alkylsulfonamino group, acylamino group, ureido group or amino group.

Preferably, R₃ is chlorine, R₄ and R₅ are hydrogen and R₆ is an acylamino group. This also includes the compounds of the formula



in which x is 0-4, R₇ is hydrogen or alkyl and R₈ and R₉ are alkyl.

Another group of yellow couplers conforms to the formula B



(B).

in which R₁₀ is hydrogen, halogen or alkoxy,

R₁₁, R₁₂ and R₁₃ are hydrogen, halogen, alkyl, alkenyl, alkoxy, aryl, carboxyl, alkoxycarbonyl, a carbamoyl group, a sulfonyl group, a sulfamoyl group, sulfonamido group, acylamino group, ureido group or amino group and R₁ and Q are as defined above.

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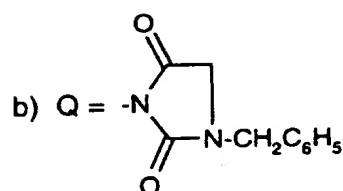
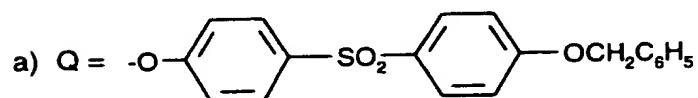
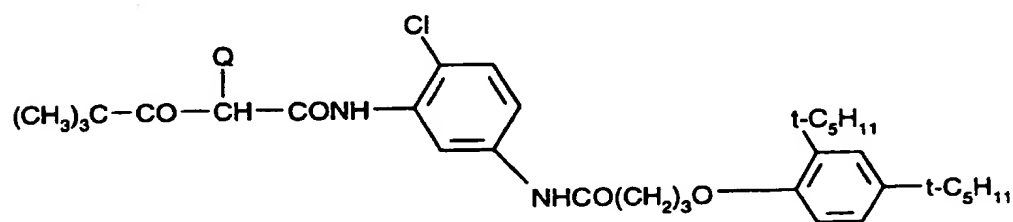
This group includes compounds of the formula B in which R_1 is t-butyl, R_{10} is chlorine, R_{11} and R_{13} are hydrogen and R_{12} is alkoxy carbonyl.

In the compounds of the formulae A and B the leaving group Q can be hydrogen or is a heterocyclic group

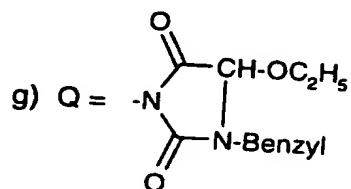
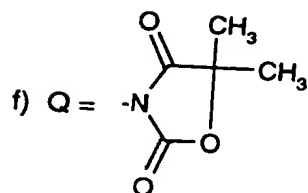
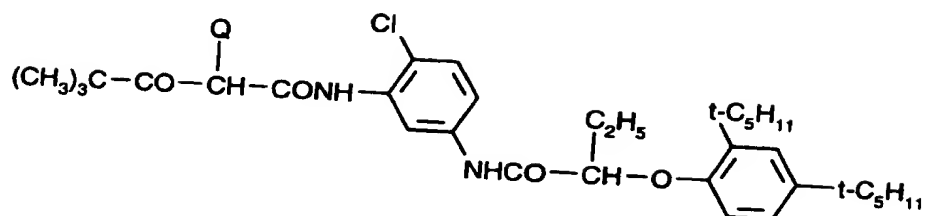
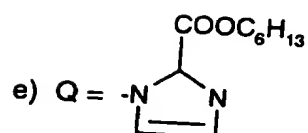
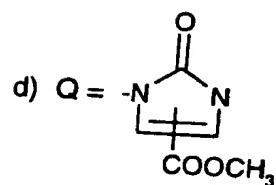
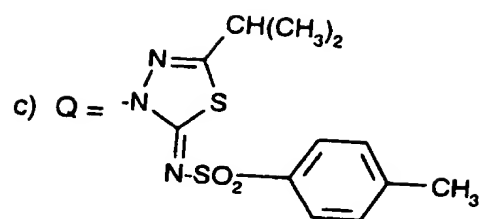


in which R_{14} is a divalent organic group which supplements the ring to make up a 4-7-membered ring, or Q is a group $-OR_{15}$ in which R_{15} is alkyl, aryl, acyl or a heterocyclic radical.

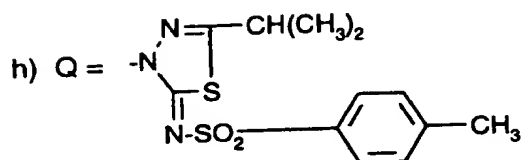
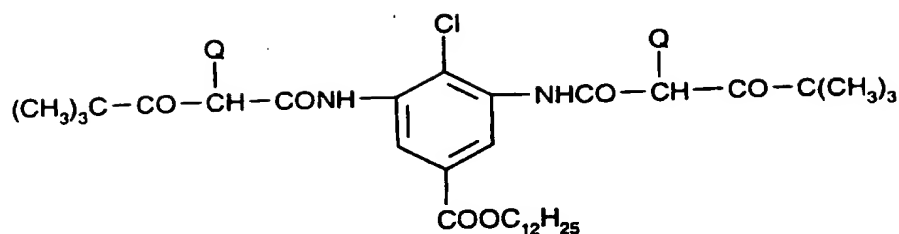
Typical examples of customary yellow couplers are the compounds of the following formulae:



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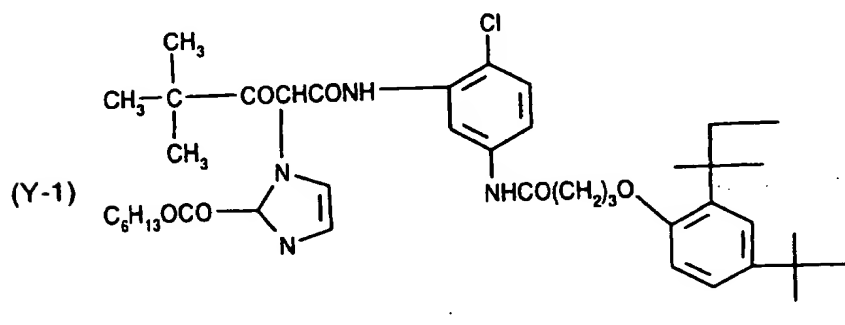
- 26 -



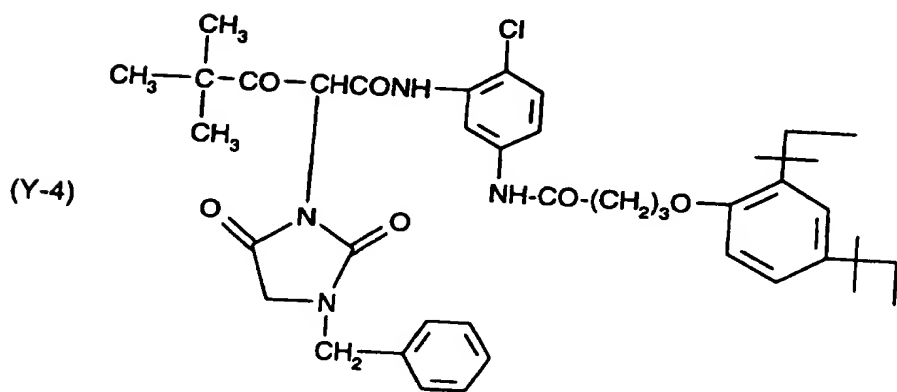
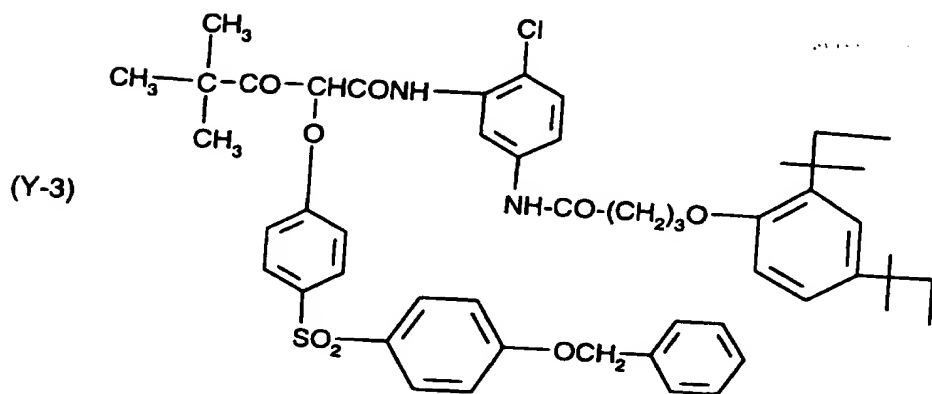
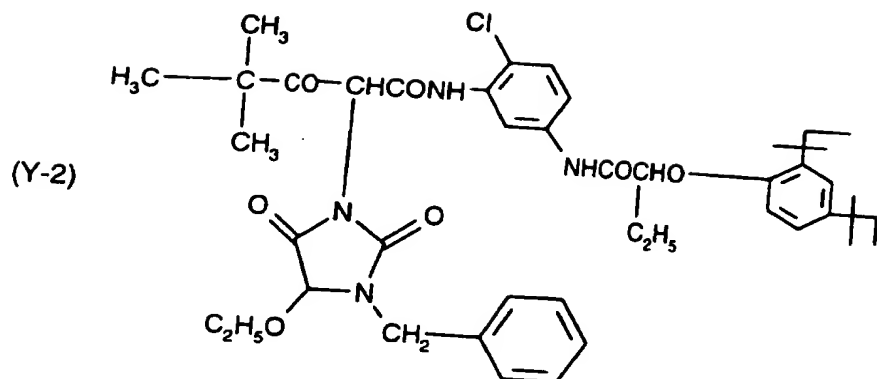
Further examples of yellow couplers are given in US-A 2,407,210, 2,778,658, 2,875,057, 2,908,513, 2,908,573, 3,227,155, 3,227,550, 3,253,924, 3,265,506, 3,277,155, 3,408,194, 3,341,331, 3,369,895, 3,384,657, 3,415,652, 3,447,928, 3,551,155, 3,582,322, 3,725,072, 3,341,331, 3,369,895, 3,384,657, 3,415,652, 3,447,928, 3,551,155, 3,582,322, 3,725,072, 3,891,445, 3,933,501, 4,115,121, 4,401,752 and 4,022,620, in DE-A 1,547,868, 2,057,941, 2,162,899, 2,163,813, 2,213,461, 2,219,917, 2,261,361, 2,261,362, 2,263,875, 2,329,587, 2,414,006 and 2,422,812, in GB-A 1,425,020 and 1,077,874 and in JP-A-88/123,047 and in EP-A-447,969.

The yellow couplers are customarily used in an amount of 0.05-2 mol and preferably 0.1-1 mol per mole of silver halide.

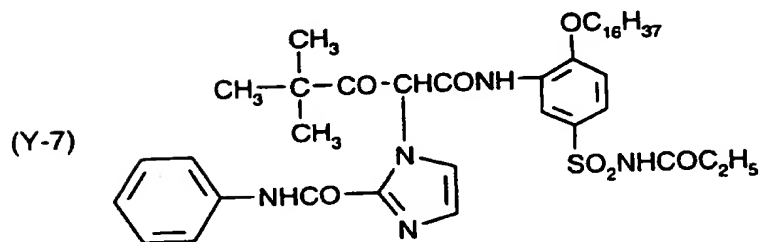
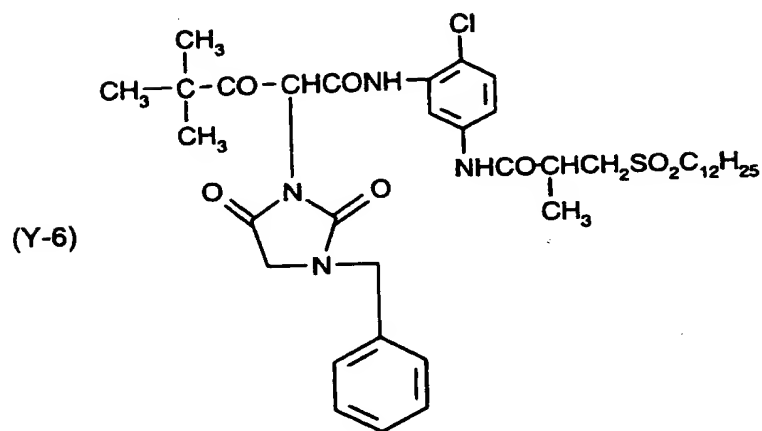
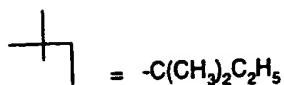
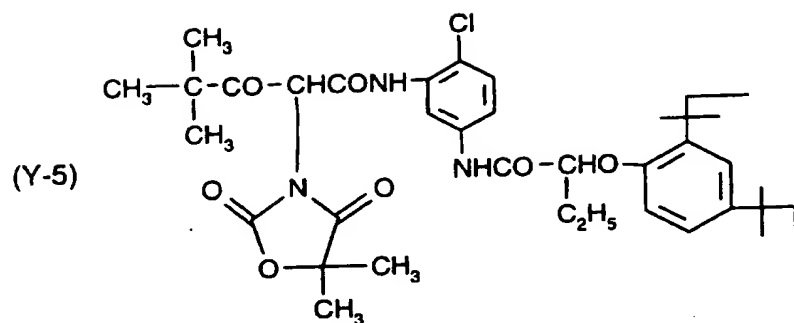
Typical and preferred yellow couplers conform to the formulae:



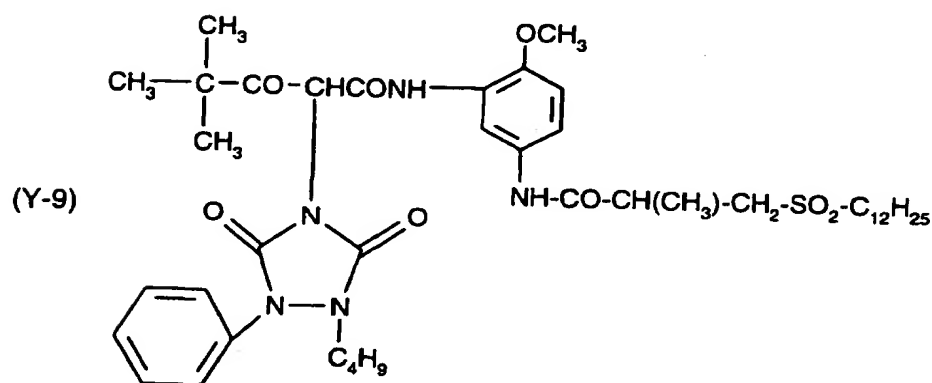
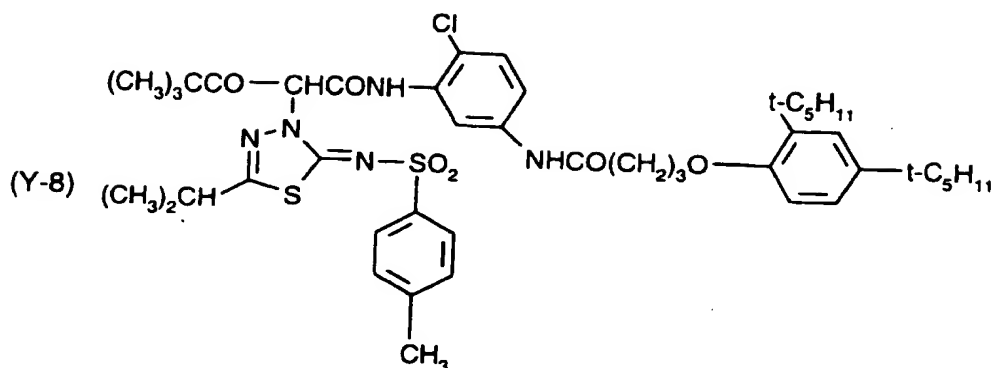
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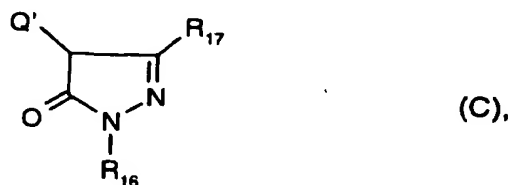


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Magenta couplers may, for example, be simple 1-aryl-5-pyrazolones or may be pyrazole derivatives which are fused with 5-membered heterocyclic rings, examples being imidazopyrazoles, pyrazolopyrazoles, pyrazolotriazoles or pyrazolotetrazoles.

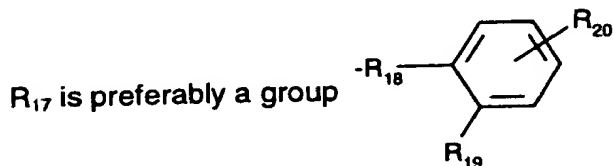
One group of magenta couplers comprises 5-pyrazolones of the formula C



as are described in British Patent 2,003,473. In this formula, R_{16} is hydrogen, alkyl, aryl,

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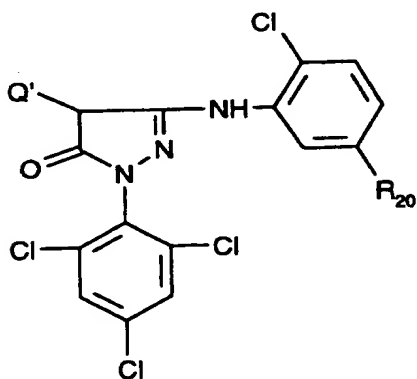
alkenyl or a heterocyclic group, R_{17} is hydrogen, alkyl, aryl, a heterocyclic group, an ester group, alkoxy group, alkylthio group, carboxyl group, arylamino group, acylamino group, (thio)urea group, (thio)carbamoyl group, guanidino group or sulfonamido group.



in which R_{18} is imino, acylamino or ureido, R_{19} is hydrogen, halogen, alkyl or alkoxy, R_{20} is hydrogen, alkyl, acylamino, carbamoyl, sulfamoyl, sulfonamido, alkoxycarbonyl, acyloxy or a urethane group.

If Q' is hydrogen, then the magenta coupler is tetraequivalent in relation to the silver halide.

Typical examples of this type of magenta coupler are compounds of the formula



in which R_{20} is as defined above and Q' , as described above, is a leaving group. These compounds are preferably present in the material of this novel process.

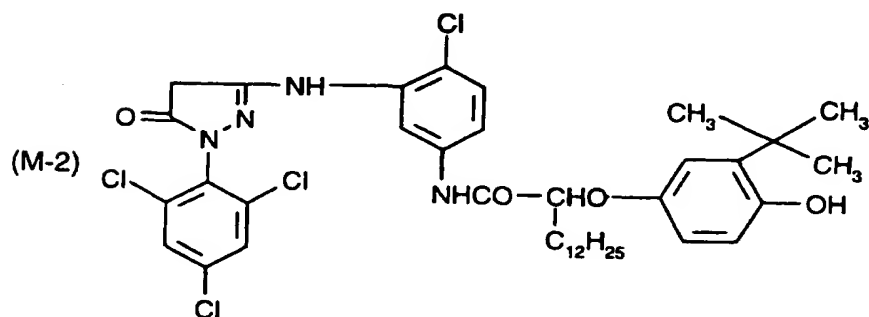
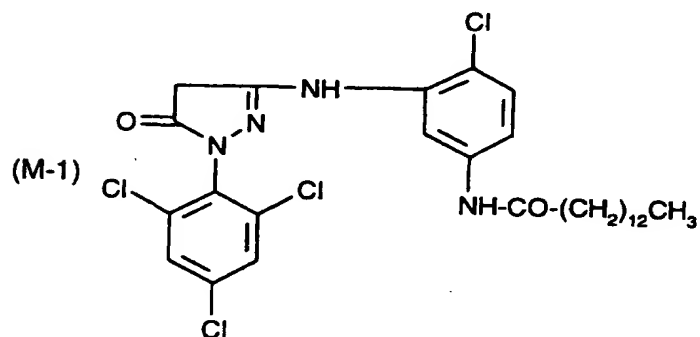
Further examples of such tetraequivalent magenta couplers are given in US-A 2,983,608, 3,061,432, 3,062,653, 3,127,269, 3,152,896, 3,311,476, 3,419,391, 3,519,429, 3,558,319, 3,582,322, 3,615,506, 3,684,514, 3,834,908, 3,888,680, 3,891,445, 3,907,571, 3,928,044, 3,930,861, 3,930,866 and 3,933,500 and in JP-A-89/309,058.

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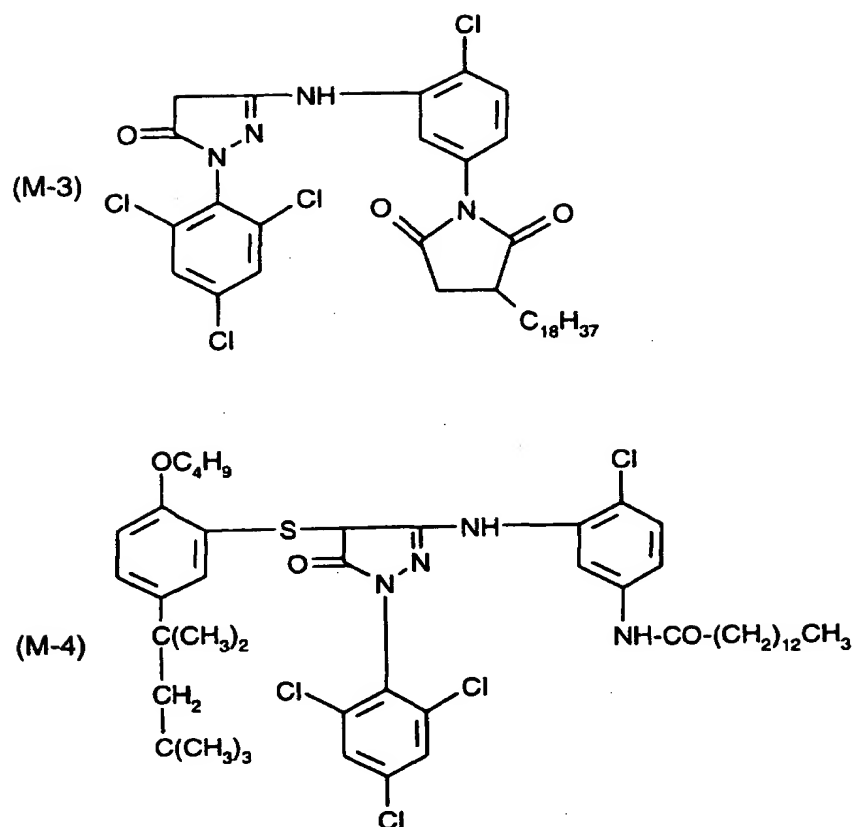
If Q' in formula C is not hydrogen but a group which is eliminated in reaction with the oxidized developer, then the magenta coupler is diequivalent. In this case Q may for example be halogen or a group which is attached via O, S or N to the pyrazole ring. Diequivalent couplers of this kind give rise to a higher colour density and are more reactive with respect to the oxidized developer than are the corresponding tetraequivalent magenta couplers.

Examples of diequivalent magenta couplers are described in US-A 3,006,579, 3,419,391, 3,311,476, 3,432,521, 3,214,437, 4,032,346, 3,701,783, 4,351,897, 3,227,554, in EP-A-133,503, DE-A-2,944,601, JP-A-78/34044, 74/53435, 74/53436, 75/53372 and 75/122935.

Typical and preferred magenta couplers conform to the formulae



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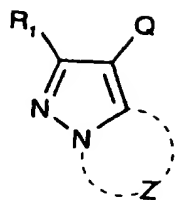


It is possible for 2 pyrazolone rings to be linked via a divalent Q', giving so-called bis-couplers. These are described, for example, in US-A-2,632,702, US-A-2,618,864, GB-A-968,461, GB-A-786,859, JP-A-76/37646, 59/4086, 69/16110, 69/26589, 74/37854 and 74/29638. Y is preferably an O-alkoxyarylthio group.

As mentioned above, the magenta couplers used can also be pyrazoles fused with 5-membered heterocycles, and are then known as pyrazoloazoles. Their advantages over simple pyrazoles are that they possess colours of greater formalin resistance and have purer absorption spectra.

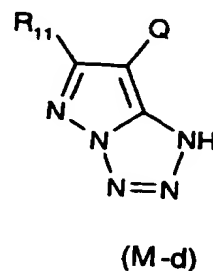
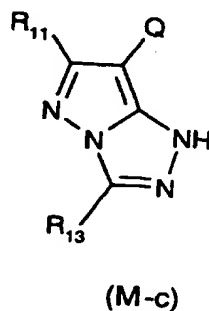
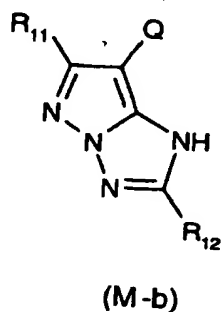
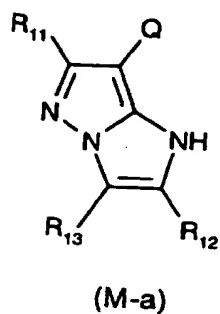
Magenta couplers of the pyrazoloazole type which are likewise preferred may be represented by the formula

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in which R_1 is hydrogen or a substituent, Z represents the non-metallic atoms necessary to complete a 5-membered ring containing 2 or 3 nitrogen atoms, which ring may be substituted, and Q is hydrogen or a leaving group.

Of these compounds, preference is given to magenta couplers of the formulae



R_{11} , R_{12} and R_{13} independently of one another are, for example, hydrogen, halogen, a group of the formula $-CR_3$ in which the radicals R , independently of one another, are hydrogen or alkyl, or aryl, heterocyclyl, cyano, hydroxyl, nitro, carboxyl, amino, alkoxy, aryloxy, acylamino, alkylamino, anilino, ureido, sulfamoylamino, alkylthio, arylthio, alkoxycarbonylamino, sulfonamido, carbamoyl, sulfamoyl, sulfonyl, alkoxycarbonyl, heterocyclyloxy, azo, acyloxy, carbamoyloxy, silyloxy, aryloxycarbonylamino, imido, heterocyclic ring-thio, sulfinyl, phosphoryl, aryloxycarbonyl, acyl or azoyl, and preferably hydrogen; halogen (e.g. chlorine, bromine), a group of the formula $-CR_3$ in which the radicals R independently of one another are hydrogen or alkyl, or aralkyl, alkenyl, alkynyl, cycloalkyl or cycloalkenyl, and particularly preferably methyl, ethyl, propyl, isopropyl, t-butyl, tridecyl, 2-methanesulfonyl, 3-(3-pentadecylphenoxy)propyl, 3-(4-(2-(4-(4-hydroxyphenylsulfonyl)phenoxy)dodecaneamido)phenyl)propyl, 2-ethoxytridecyl, trifluoromethyl, cyclopentyl, 3-(2,4-di-t-amylphenoxy)propyl; aryl (e.g. phenyl, 4-t-butylphenyl, 2,4-di-t-amylphenyl, 4-tetradecanamidophenyl); heterocyclyl (e.g.

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2-furyl, 2-thienyl, 2-pyrimidinyl, 2-benzothiazolyl); cyano; hydroxyl, nitro; carboxyl; amino; alkoxy (e.g. methoxy, ethoxy, 2-methoxyethoxy; 2-dodecylethoxy, 2-methanesulfonylethoxy); aryloxy (e.g. phenoxy, 2-methylphenoxy, 4-t-butylphenoxy, 3-nitrophenoxy, 3-t-butyloxycarbamoylphenoxy, 3-methoxycarbamoyl); acylamino (e.g. acetamido, benzamido, tetradecaneamido, 2-(2,4-di-t-amylphenoxy)butaneamido, 4-(3-t-butyl-4-hydroxyphenoxy)butaneamido, 2-(4-(4-hydroxyphenylsulfonyl)phenoxy)decaneamido); methylbutylamino); anilino (e.g. phenylamino, 2-chloroanilino, 2-chloro-5-tetradecaneaminoanilino, 2-chloro-5-dodecyloxycarbonylanilino, N-acetylanilino, 2-chloro-5-(alpha-(3-t-butyl-4-hydroxyphenoxy)dodecaneamidoanilino); ureido (e.g. phenylureido, methylureido, N,N-dibutylureido); sulfamoylamino (e.g. N,N-dipropylsulfamoylamino, N-methyl-N-decylsulfamoylamino); alkylthio (e.g. methylthio, octylthio, tetradecylthio, 2-phenoxyethylthio, 3-phenoxypropylthio, 3-(4-t-butylphenoxy)propylthio); arylthio (e.g. phenylthio, 2-butoxy-5-t-octylphenylthio, 3-pentadecylphenylthio, 2-carboxyphenylthio, 4-tetradecaneamidophenylthio); alkoxycarbonylamino (e.g. methoxycarbonylamino, tetradecyloxycarbonylamino); sulfonamido (e.g. methanesulfonamido, hexadecanesulfonamido, benzenesulfonamido, p-toluenesulfonamido, octadecanesulfonamido, 2-methoxy-5-t-butylbenzenesulfonamido); carbamoyl (e.g. N-ethylcarbamoyl, N,N-dibutylcarbamoyl, N-(2-dodecyloxyethyl)carbamoyl, N-methyl-N-dodecylcarbamoyl, N-(3-(2,4-di-t-amylphenoxy)propyl)carbamoyl); sulfamoyl (e.g. N-ethylsulfamoyl, N,N-dipropylsulfamoyl, N-2-(dodecyloxyethyl)sulfamoyl, N-ethyl-N-dodecylsulfamoyl, N,N-diethylsulfamoyl); sulfonyl (e.g. methanesulfonyl, octanesulfonyl, benzenesulfonyl, toluenesulfonyl); alkoxycarbonyl (e.g. methoxycarbonyl, butoxycarbonyl, dodecyloxycarbonyl, octadecyloxycarbonyl); heterocyclic ring-oxy (e.g. 1-phenyltetrazole-5-oxy, 2-tetrahydropyranyloxy); azo (e.g. phenylazo, 4-methoxyphenylazo, 4-pivaloylaminophenylazo, 2-hydroxy-4-propanoylphenylazo); acyloxy (e.g. acetoxy); carbamoyloxy (e.g. N-methylcarbamoyloxy, N-phenylcarbamoyloxy); silyloxy (e.g. trimethylsilyloxy, dibutylmethylsilyloxy); aryloxycarbonylamino (e.g. phenoxy carbonylamino); imido (e.g. N-succinimido, N-phthalimido, 3-octadecenylsuccinimido); heterocyclic ring-thio (e.g. 2-benzothiazolylthio, 2,4-diphenyloxy-1,3,5-triazole-6-thio, 2-pyridylthio); sulfinyl (e.g. dodecanesulfinyl, 3-pentadecylphenylsulfinyl, 3-phenoxypropylsulfinyl); phosphonyl (e.g. phenoxyphosphonyl, octyloxyphosphonyl, phenylphosphonyl); aryloxycarbonyl (e.g. phenoxy carbonyl); acyl (e.g. acetyl, 3-phenylpropanoyl, benzoyl, 4-dodecyloxybenzoyl); azolyl (e.g. imidazolyl, pyrazolyl, 3-chloropyrazol-1-yl).

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These substituents may be substituted further, for example by halogen or by an organic radical attached via a C, O, N or S atom.

The preferred groups R_{11} are alkyl, aryl, alkoxy, aryloxy, alkylthio, ureido, urethane and acyl-amino groups.

R_{12} may be as defined for R_{11} and is preferably hydrogen, alkyl, aryl, a heterocyclic ring, alkoxy-carbonyl, carbamoyl, sulfamoyl, sulfinyl, acyl or cyano.

R_{13} may be as defined for R_{11} and is preferably hydrogen, alkyl, aryl, heterocyclyl, alkoxy, aryloxy, alkylthio, arylthio, alkoxy-carbonyl, carbamoyl or acyl, preferably alkyl, aryl, heterocyclyl, alkylthio or arylthio.

Q is hydrogen or a leaving group such as halogen, alkoxy, aryloxy, acyloxy, alkyl- or aryl-sulfonyloxy, acylamino, alkyl- or arylsulfonamido, alkoxy-carbonyloxy, aryloxy-carbonyloxy, alkyl-, aryl- or heterocyclyl-S-carbamoylamino, a 5- or 6-membered nitrogen-containing heterocyclic radical, imido and arylazo. These groups may be further substituted as indicated for R_{11} .

Q is preferably halogen (for example fluorine, chlorine, bromine); alkoxy (e.g. ethoxy, dodecyloxy, methoxyethylcarbamoylmethoxy, carboxypropyloxy, methylsulfonylethoxy, ethoxycarbonylmethoxy); aryloxy (e.g. 4-methylphenoxy, 4-chlorophenoxy, 4-methoxyphenoxy, 4-carboxyphenoxy, 3-ethoxycarboxyphenoxy, 3-acetylaminophenoxy, 2-carboxyphenoxy); acyloxy (e.g. acetoxy, tetradecanoyloxy, benzoyloxy); alkyl- or aryl-sulfonyloxy (e.g. methanesulfonyloxy, toluenesulfonyloxy); acylamino (e.g. dichloroacetyl-amino, heptafluorobutyrylamino); alkyl- or arylsulfonamido (e.g. methanesulfonamido, trifluoromethanesulfonamido, p-toluenesulfonylamido); alkoxy-carbonyloxy (e.g. ethoxy-carbonyloxy, benzyloxy-carbonyloxy); aryloxy-carbonyloxy (e.g. phenoxycarbonyloxy); alkyl-, aryl- or heterocyclyl-S- (e.g. dodecylthio, 1-carboxydodecylthio, phenylthio, 2-butoxy-5-t-octylphenylthio, tetrazolylthio); carbamoylamino (e.g. N-methylcarbamoylamino, N-phenylcarbamoylamino); 5- or 6-membered nitrogen-containing ring (e.g. imidazolyl, pyrazolyl, triazolyl, tetrazolyl, 1,2-dihydro-2-oxo-1-pyridyl); imido (e.g. succinimido, hydantoinyl); arylazo (e.g. phenylazo, 4-methoxyphenylazo).

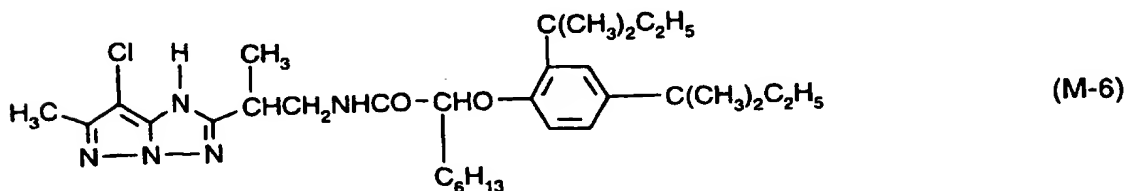
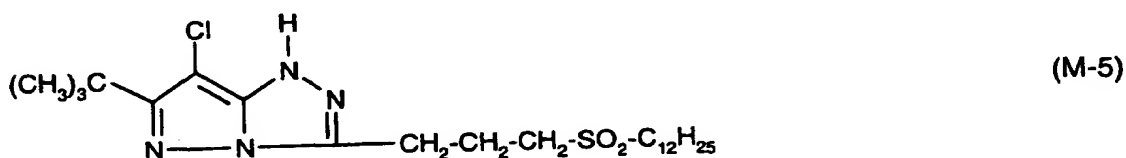
- 36 -

Q may alternatively form corresponding bis-compounds by condensation of 4 equivalents of coupler with an aldehyde or ketone. Furthermore, Q may contain photographically active groups, such as development inhibitors or development accelerators. Q is preferably halogen, alkoxy, aryloxy, alkyl- or arylthio, or a 5- or 6-membered nitrogen-containing heterocyclic group which is bonded to the coupling site via a nitrogen atom.

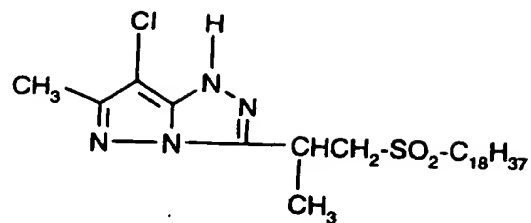
Pyrazolotetrazoles are described in JP-A-85/33552; pyrazolopyrazoles in JP-A-85/43,695; pyrazoloimidazoles in JP-A-85/35732, JP-A-86/18949 and US-A-4,500,630; pyrazolotriazoles in JP-A-85/186,567, JP-A-86/47957, JP-A-85/215,687, JP-A-85/197,688, JP-A-85/172,982, EP-A-119,860, EP-A-173,256, EP-A-178,789, EP-A-178,788 and in Research Disclosure 84/24,624.

Further pyrazoloazole magenta couplers are described in: JP-A-86/28,947, JP-A-85/140,241, JP-A-85/262,160, JP-A-85/213,937, JP-A-87/278,552, JP-A-87/279,340, JP-A-88/100,457, EP-A-177,765, EP-A-176,804, EP-A-170,164, EP-A-164,130, EP-A-178,794, DE-A-3,516,996, DE-A-3,508,766 and Research Disclosure 81/20919, 84/24531 and 85/25758.

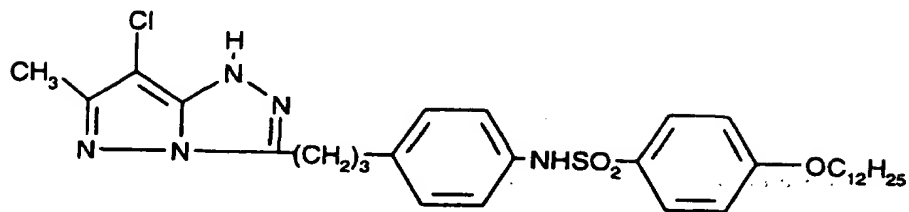
Suitable examples of such couplers are:



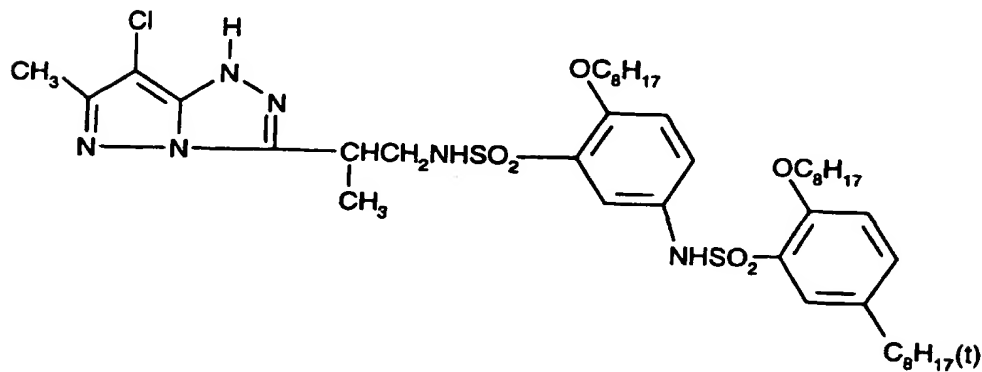
- 37 -



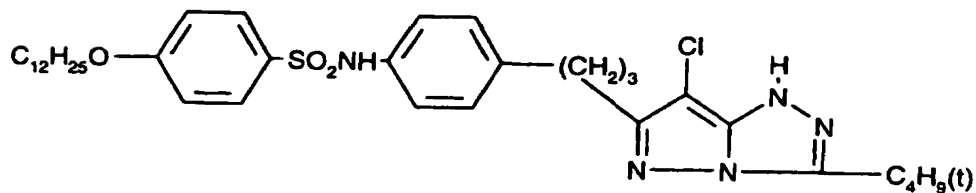
(M-7)



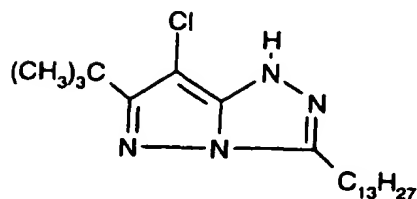
(M-8)



(M-9)

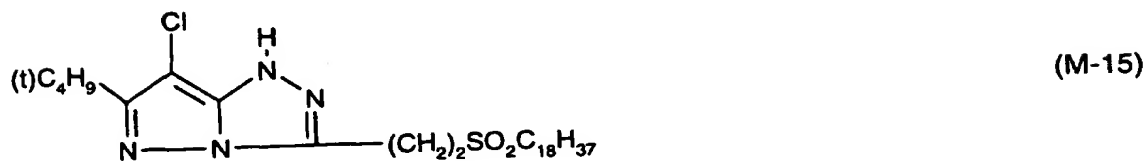
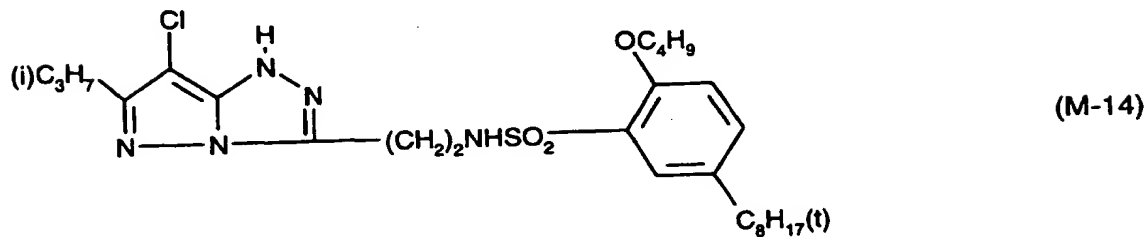
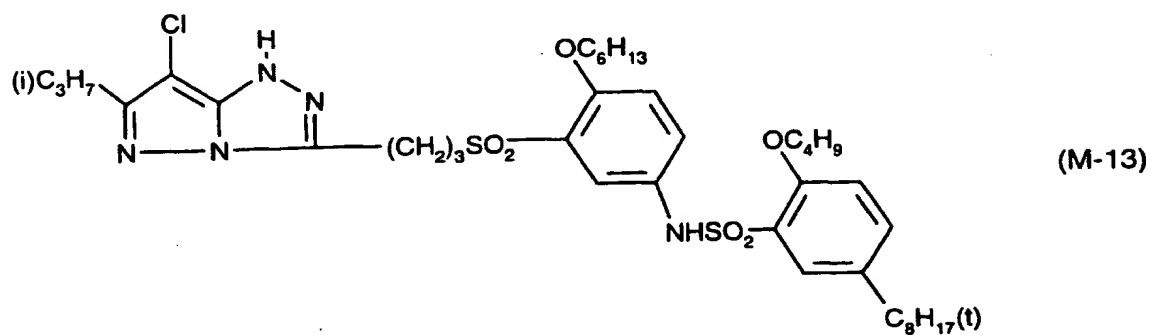
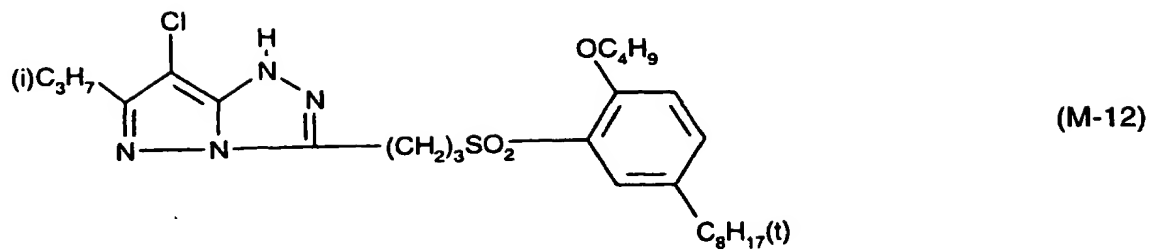


(M-10)

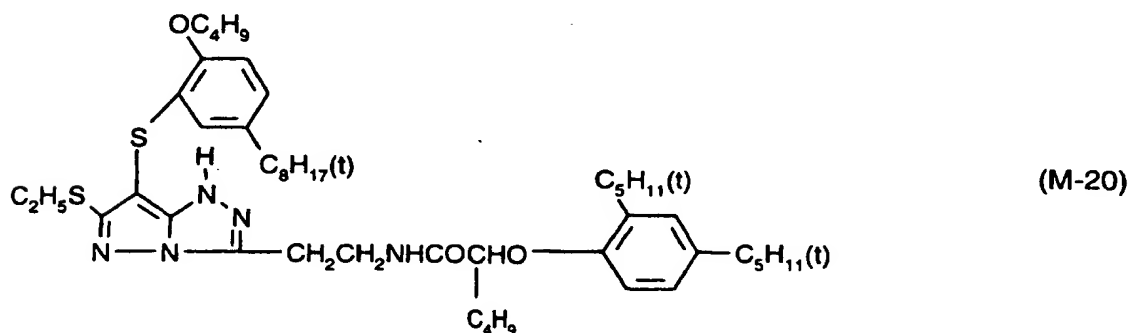
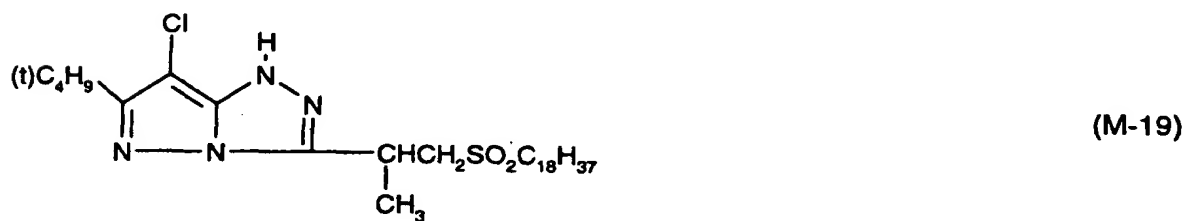
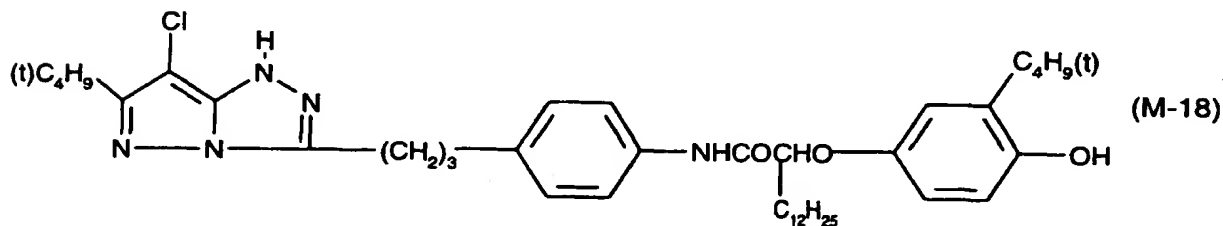
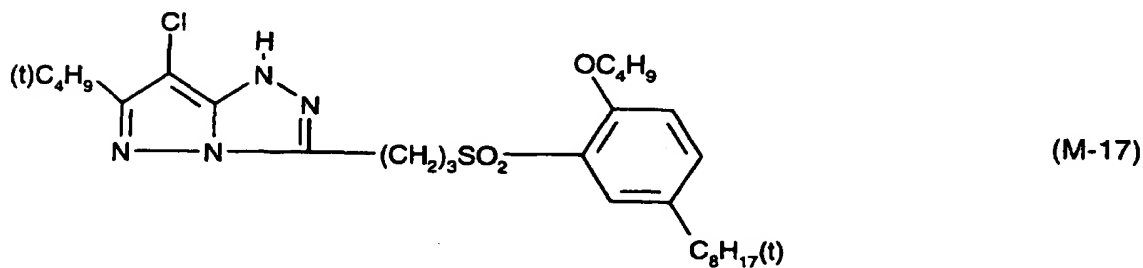
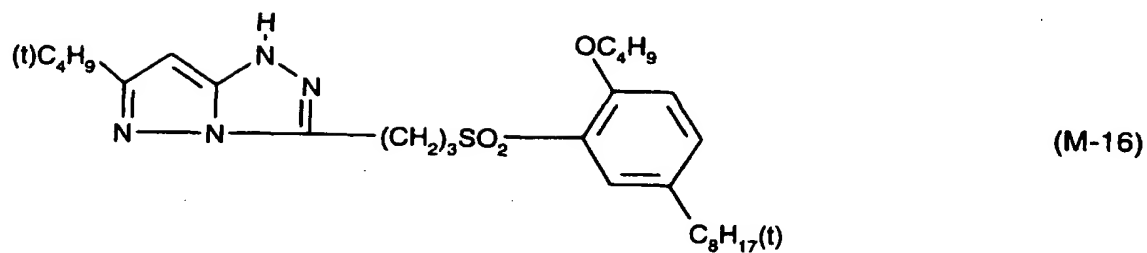


(M-11)

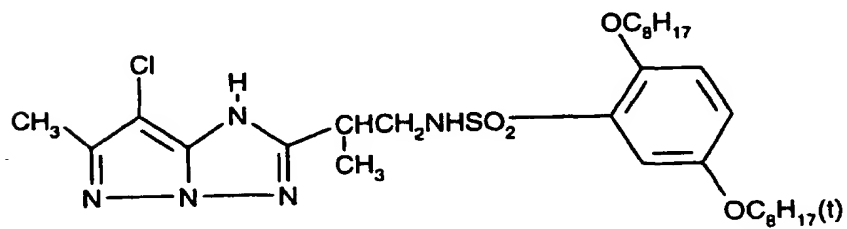
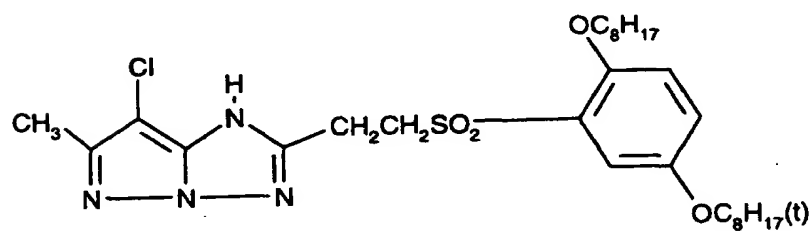
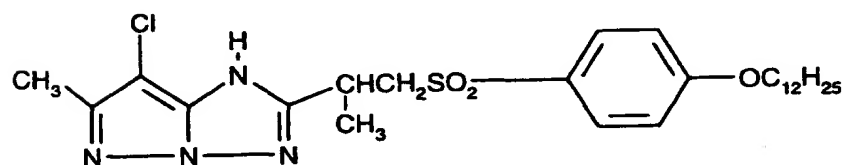
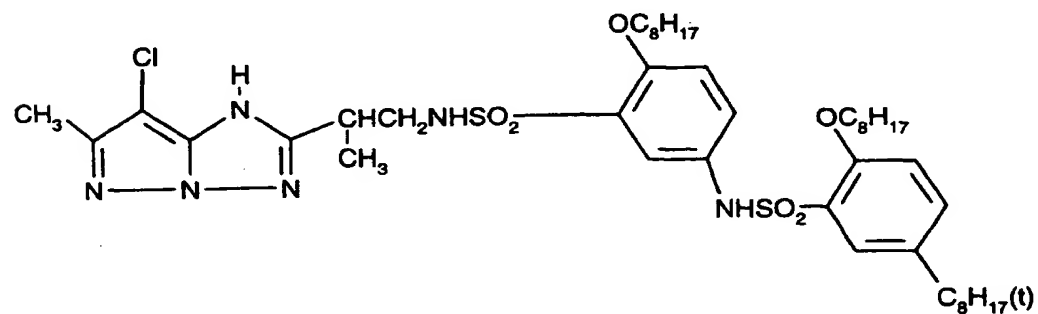
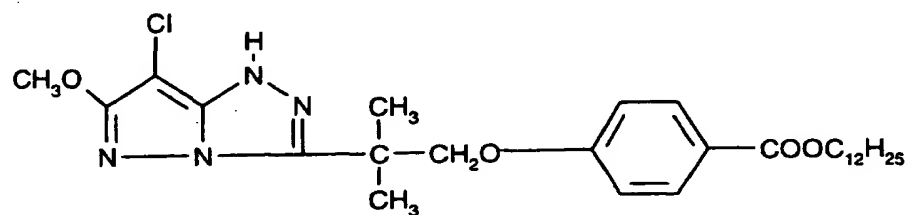
- 38 -



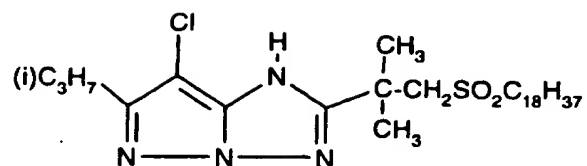
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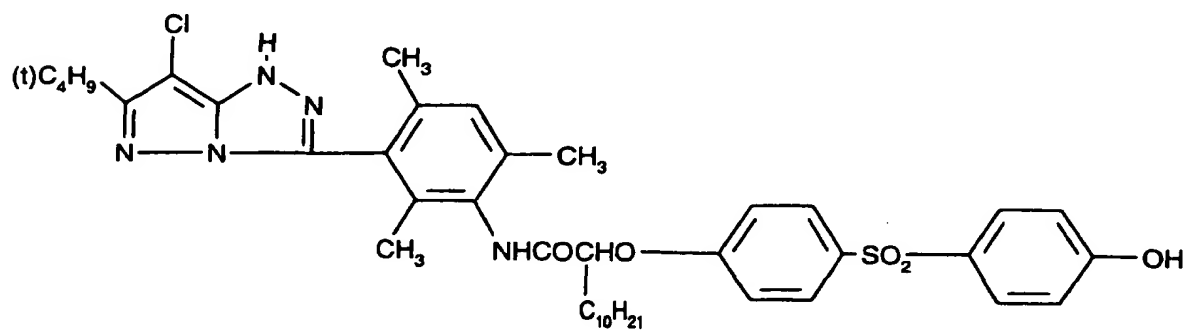
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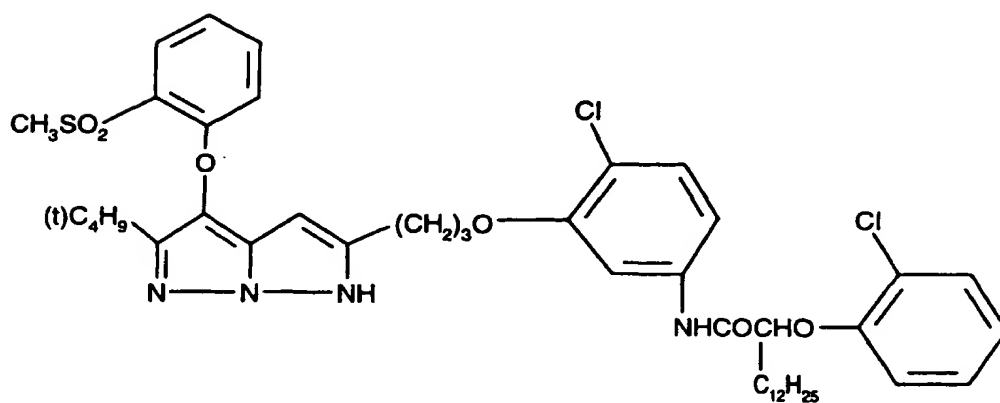
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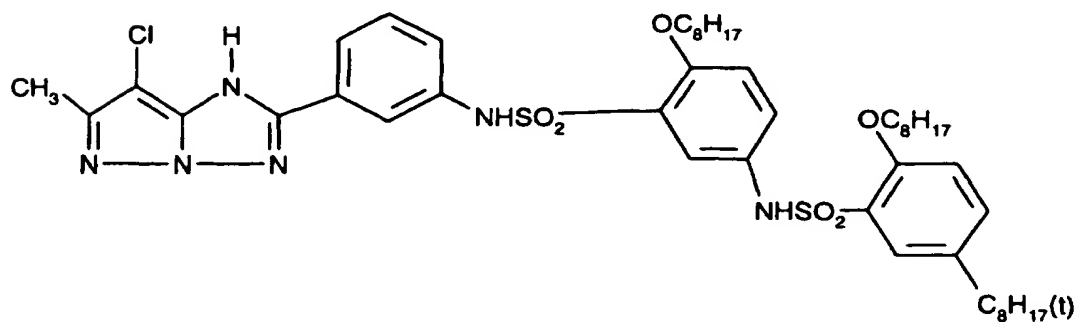
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(M-27)



(M-28)

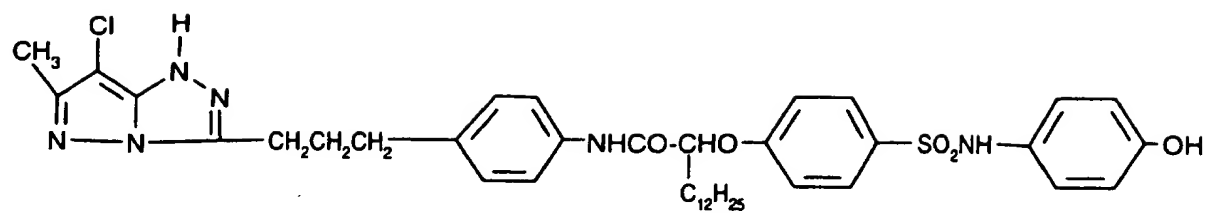


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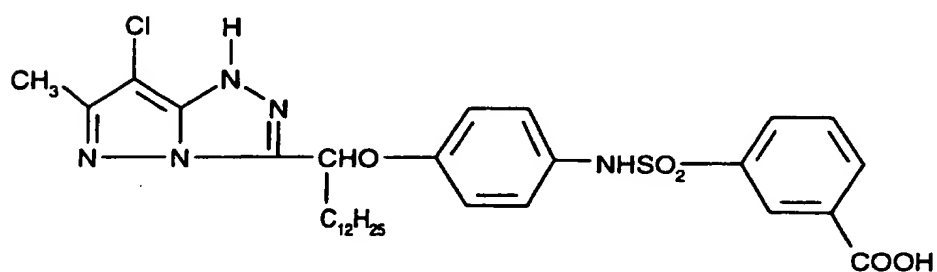
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42

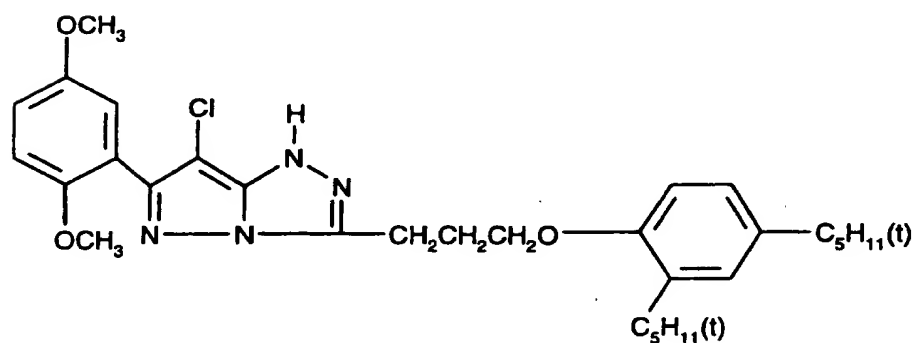
- 43 -



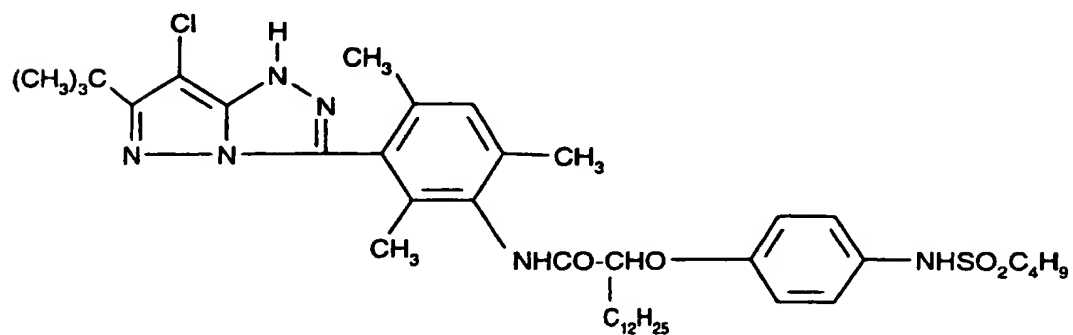
(M-34)



(M-35)

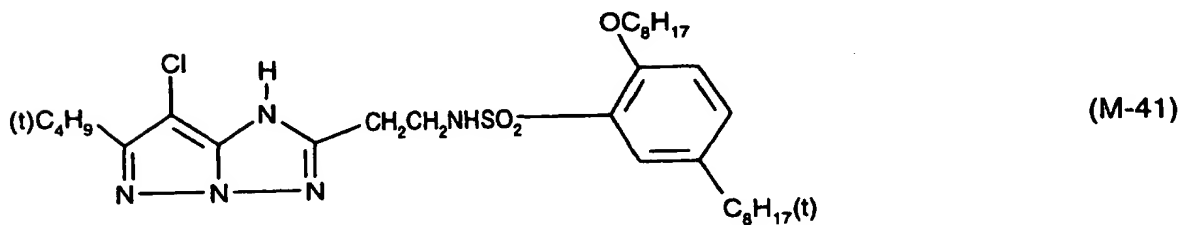
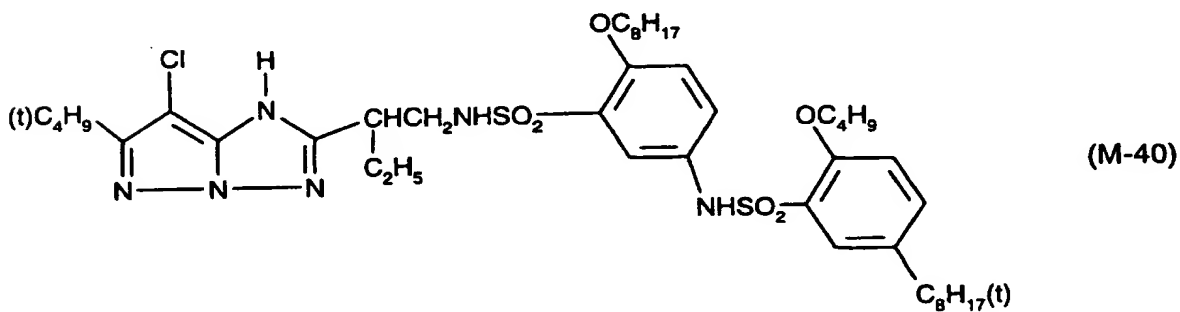
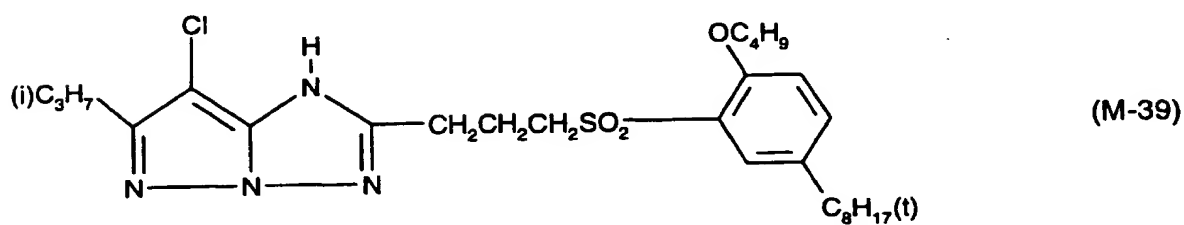
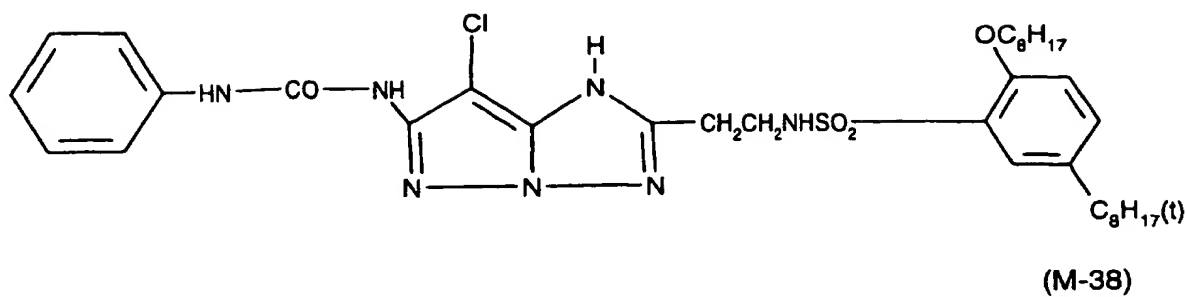


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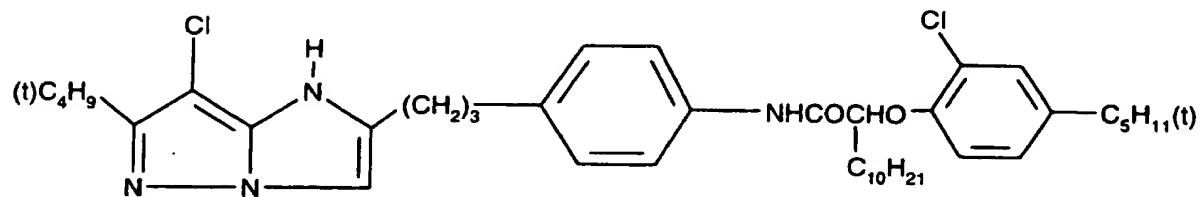


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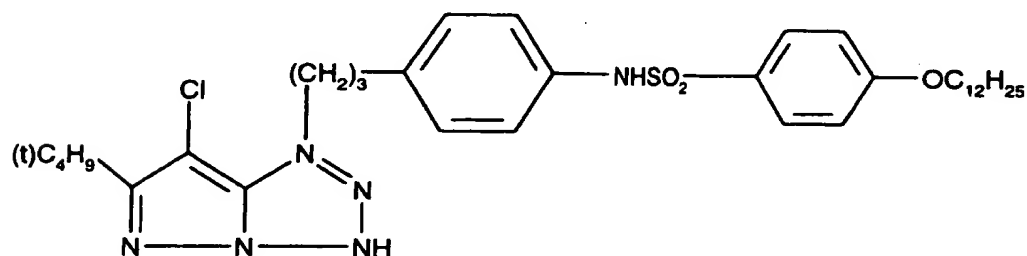
- 44 -



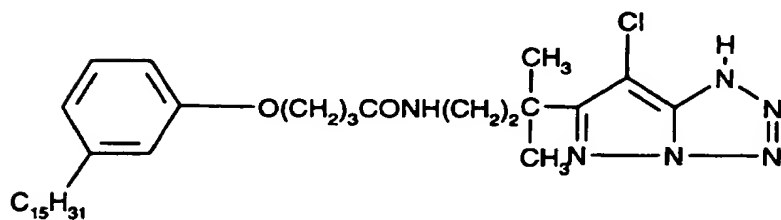
- 45 -



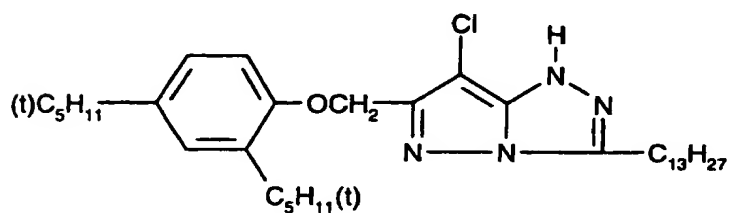
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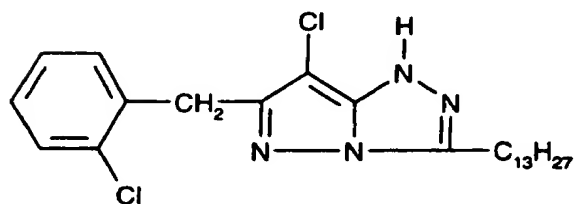
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(M-44)

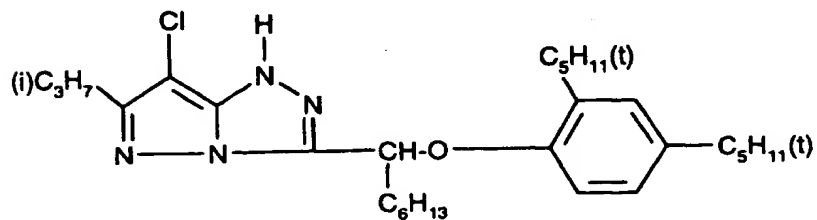
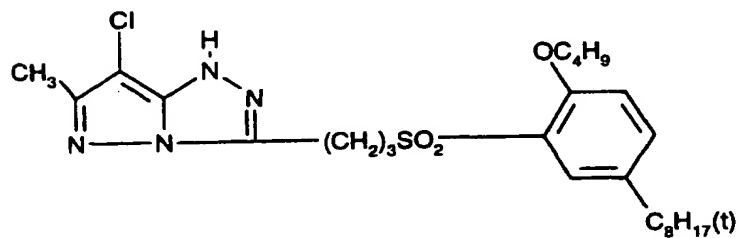
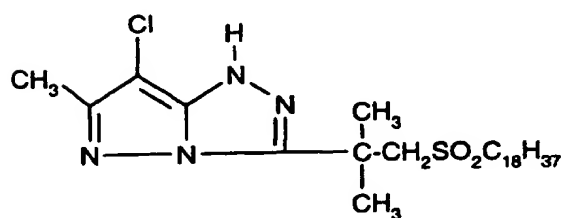
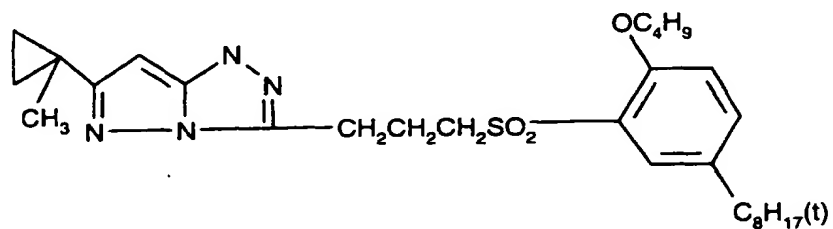


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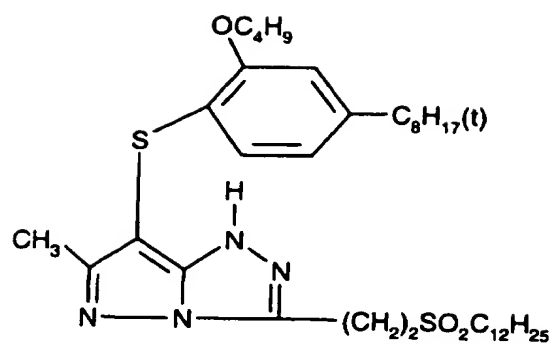


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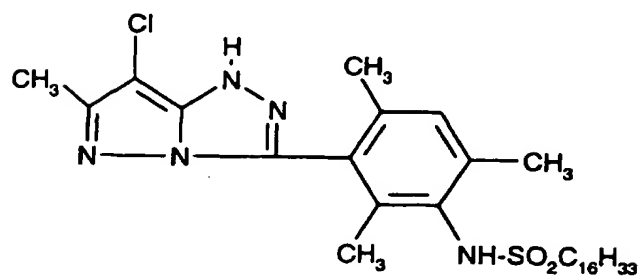
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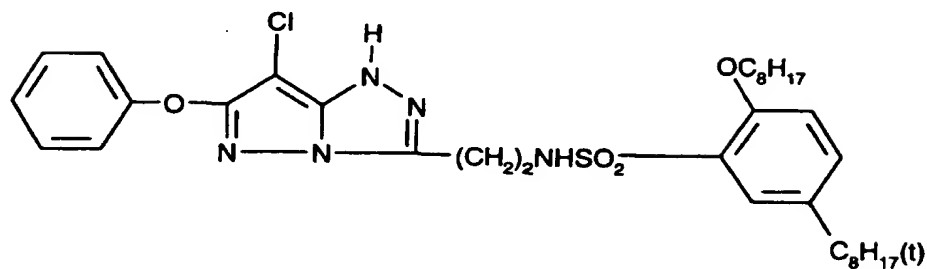
- 47 -



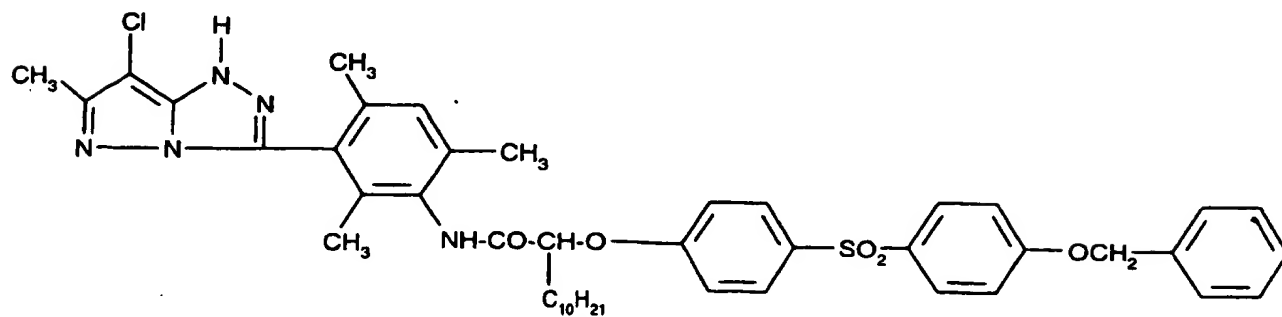
(M-51)



(M-52)

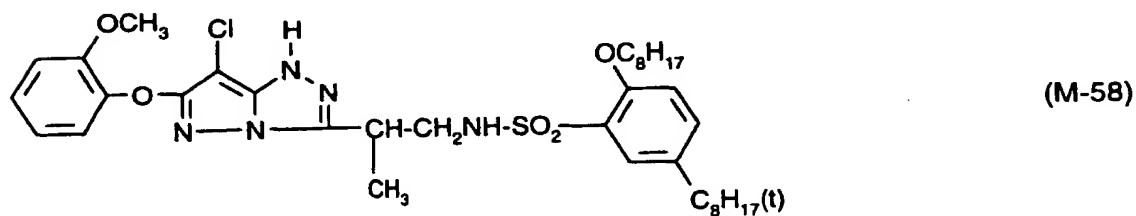
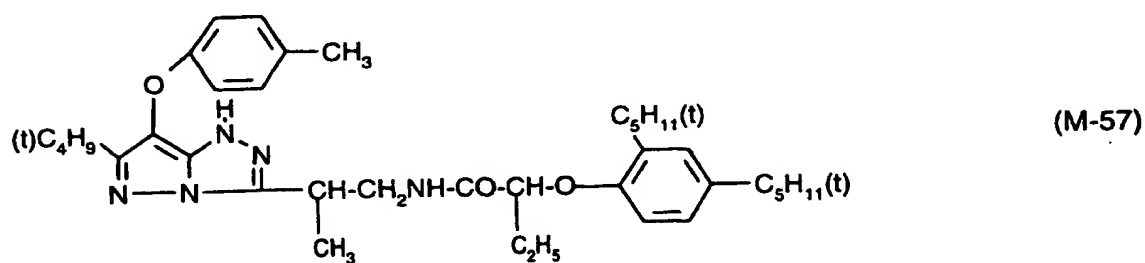
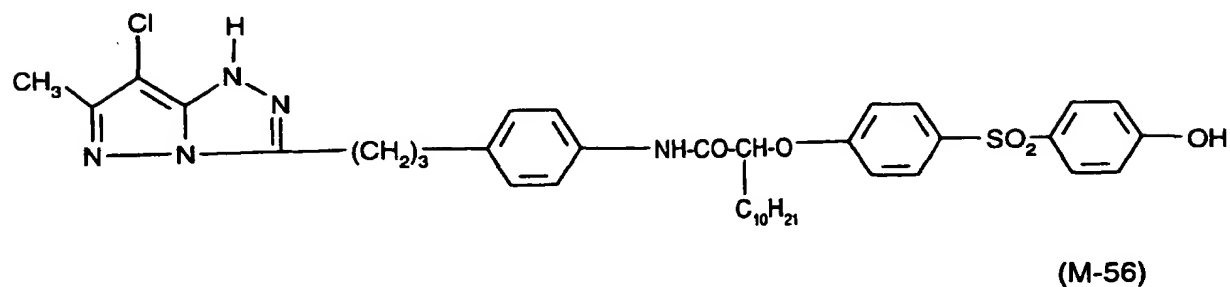
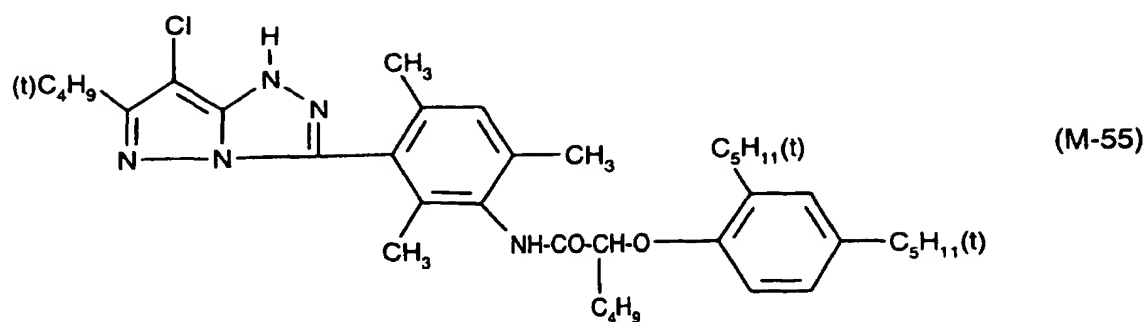


(M-53)

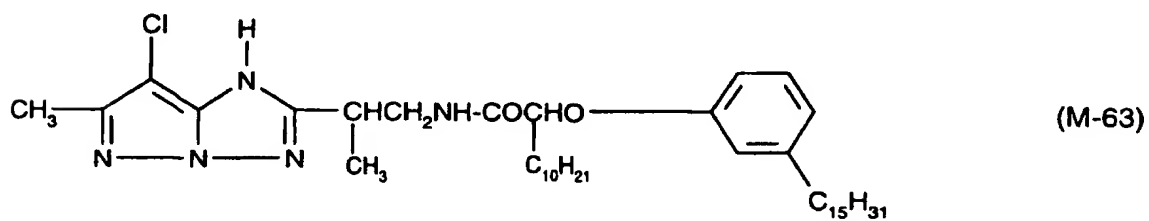
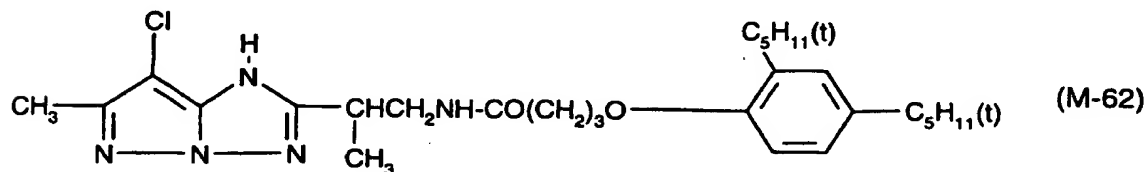
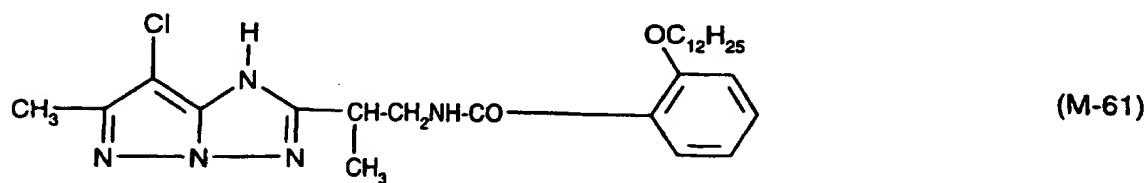
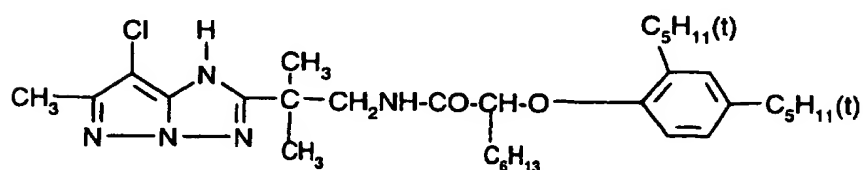
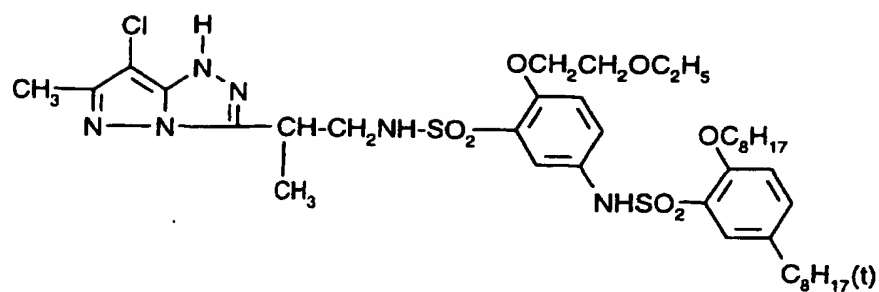


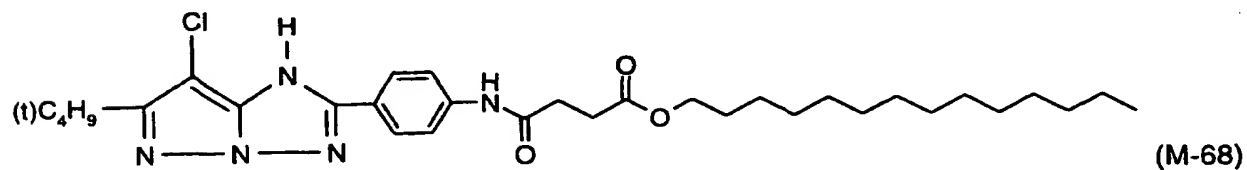
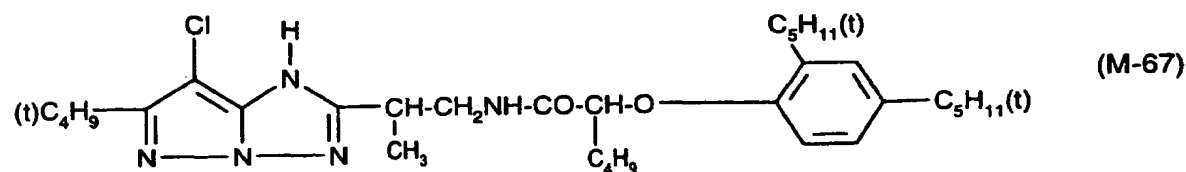
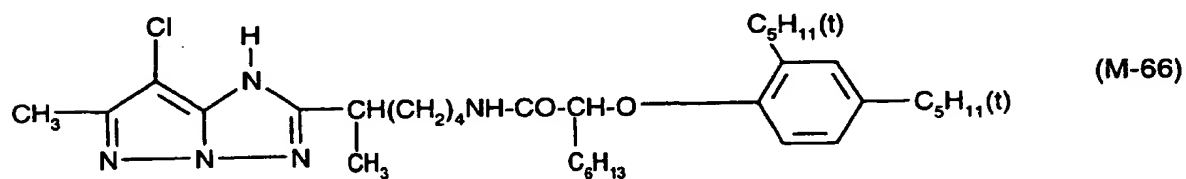
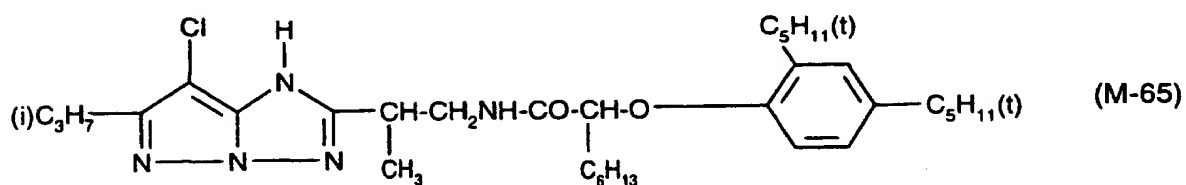
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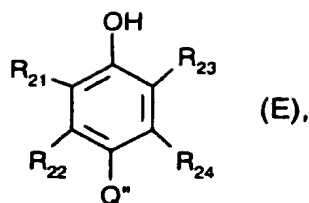
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CC1=C(Cl)N2C(=N1)NC(C)C2CNC(=O)C(C13=CC=CC=C13OC14CCCCCCCCCCCCCCCCC14)OC15=CC=CC=C15 (M-64)

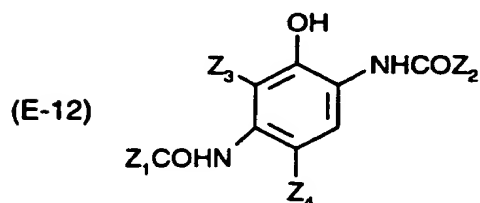
50

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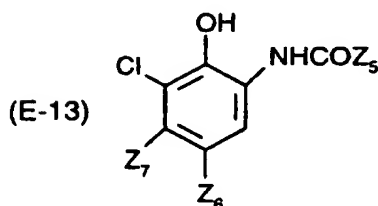


in which R_{21} , R_{22} , R_{23} and R_{24} are hydrogen, halogen, alkyl, carbamoyl, amino, sulfonamido, phosphoramido or ureido. R_{21} is preferably H or Cl, R_{22} is preferably an alkyl or amino group. R_{23} is preferably an amino group and R_{24} is preferably hydrogen. Q'' is hydrogen (4-equivalent coupler) or a leaving group (2-equivalent coupler) which is eliminated on reaction with the oxidized developer. An exhaustive listing of cyan couplers can be found in US-A-4,456,681.

The cyan couplers employed in the red-sensitive silver halide emulsion layer of the novel material are preferably of the formula



and/or of the formula

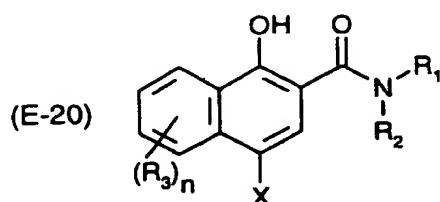


in which

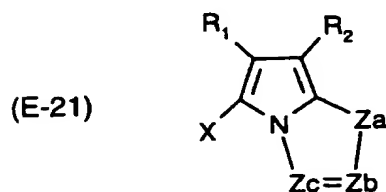
Z_1 is alkyl, aryl, Z_2 is alkyl, cycloalkyl, aryl, a heterocyclic group or a ballast group, Z_3 is hydrogen or halogen, Z_1 and Z_3 together can form a ring, and Z_4 is hydrogen or a leaving group, and Z_5 is a ballast group, Z_6 is hydrogen or a leaving group and Z_7 is alkyl

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and/or also those of the formulae E20 and E21



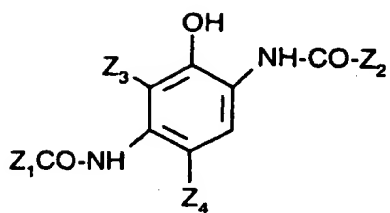
in which R_1 is preferably substituted phenyl and R_2 and R_3 are preferably H and X is preferably H or a group which is cleaved by reaction with the oxidized form of the developer, and



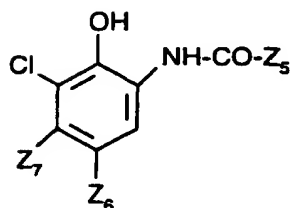
in which Z_a is $-NH-$ or $-CH(R_3)-$; Z_b and Z_c independently of one another are $-C(R_4)=$ or $-N=$; R_1 , R_2 and R_3 are each an electron-attracting group having a Hammett substituent constant σ_p of at least 0.2, with the sum of the σ_p values of R_1 and R_2 being at least 0.65; R_4 is H or a substituent, and if two R_4 s are present in the formula, they can be identical or different; and X is H or a group capable of elimination in the coupling reaction with the oxidation product of an aromatic primary amine as colour developer; or R_1 , R_2 , R_3 , R_4 or X is a divalent group by means of which the cyan coupler is able to form a dimer or higher polymer, or to react with a polymer chain to form a homo- or copolymer.

Preference is given to a photographic material in which the red-sensitive silver halide emulsion layer comprises a cyan coupler of one of the formulae C1, C2, C3, C4, C5, C6, C7 and C8

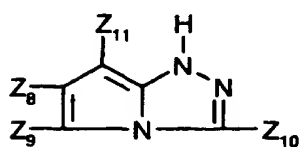
- 53 -



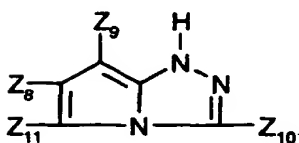
C1



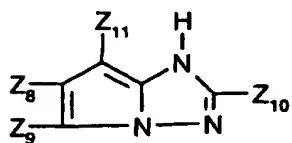
C2



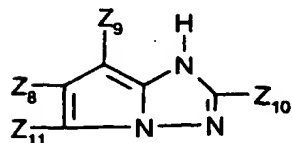
C3



C4

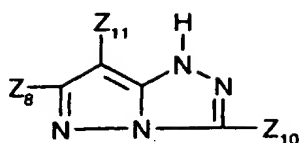


C5

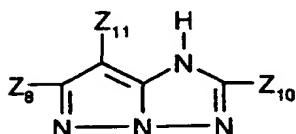


C6

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C7



C8

in which

Z_1 is alkyl or aryl,

Z_2 is alkyl, cycloalkyl, aryl, a heterocyclic group or a ballast group,

Z_3 is H or halogen, or Z_1 and Z_3 together form a ring,

Z_4 is H or a leaving group,

Z_5 is a ballast group,

Z_6 is H or a leaving group,

Z_7 is alkyl,

Z_8 and Z_9 independently of one another are H or a substituent, at least one of the groups Z_8 and Z_9 being an electron-withdrawing group having a Hammett constant ($-\sigma_p$) of 0.15 or more [Z_8 and Z_9 can be connected to one another to form a ring structure];

Z_{10} is a substituent and

Z_{11} is H or a leaving group.

The cyan couplers can also be connected to one another by way of the radicals Z_8 , Z_9 , Z_{10} or Z_{11} to form dimers or polymers.

Suitable leaving groups are in general those substituents which are set free after coupling with the oxidation product of a colour developer based on aromatic primary amines.

The novel photographic material preferably comprises those cyan couplers of the formulae C1-C8 in which

Z_1 is alkyl or aryl,

Z_2 is alkyl, aryl, or a ballast group,

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Z_3 is H or halogen,
 Z_4 is H or a leaving group,
 Z_5 is a ballast group,
 Z_6 is H or a leaving group,
 Z_7 is alkyl,
 Z_8 and Z_9 independently of one another are CN, CF_3 , $COOZ_{12}$, COZ_{12} , SO_2Z_{12} , $CON(Z_{13})Z_{14}$, $SO_2N(Z_{13})Z_{14}$, and
 Z_{12} is unsubstituted alkyl or aryl,
 Z_{13} and Z_{14} independently of one another are unsubstituted or substituted alkyl, aryl, heterocyclyl, alkoxy, aryloxy or heterocycloxy, and
 Z_{13} can also be H;
 Z_{10} embraces the definitions given for Z_8 and Z_9 or is alkyl, aryl, heterocyclyl, nitro, $NH-CO-Z_{15}$, $N(Z_{15})Z_{16}$, $NH-CO-N(Z_{15})Z_{16}$, $NH-SO_2N(Z_{15})$, $S-Z_{15}$, $NH-CO-OZ_{15}$, $NH-SO_2N(Z_{15})Z_{16}$, SOZ_{15} , and
 Z_{15} and Z_{16} are each a substituent, and Z_{16} can also be H.

The colour developers usually used for colour photographic recording materials are p-dialkylaminoanilines. Examples of these are 4-amino-N,N-diethylaniline, 3-methyl-4-amino-N,N-diethylaniline, 4-amino-N-ethyl-N- α -hydroxyethylaniline, 3-methyl-4-amino-N-ethyl-N- α -hydroxyethylaniline, 3-methyl-4-amino-N-ethyl-N- α -hydroxyethylaniline, 3-methyl-4-amino-N-ethyl-N- α -methanesulfonamidoethylaniline, 3-methyl-4-amino-N-ethyl-N- α -methoxyethyl-aniline, 3- α -methanesulfonamidoethyl-4-amino-N,N-diethylaniline, 3-methoxy-4-amino-N-ethyl-N- α -hydroxyethylaniline, 3-methoxy-4-amino-N-ethyl-N- α -methoxyethylaniline, 3-acetamido-4-amino-N,N-diethylaniline, 4-amino-N,N-dimethylaniline, N-ethyl-N- α -[α' -(α'' -methoxyethoxy)ethoxy]ethyl-3-methyl-4-aminoaniline, N-ethyl-N- α -(α' -methoxyethoxy)ethyl-3-methyl-4-aminoaniline, and also the salts of such compounds, for example sulfates, hydrochlorides or toluenesulfonates.

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The compounds of the formula (I) which can be used in the context of this invention can be incorporated into the colour photographic recording material, on their own or together with the colour coupler and with or without further additives, by predissolving them in high-boiling organic solvents. Preference is given to the use of solvents which boil at higher than 160°C. Typical examples of these solvents are the esters of phthalic acid, phosphoric acid, citric acid, benzoic acid or of fatty acids, and also alkylamides and phenols.

A low-boiling solvent is usually used in addition in order to simplify incorporation of the additives into the colour-photographic recording material. Examples of such solvents are esters, for example ethyl acetate, alcohols, for example butanol, ketones, for example methyl isobutyl ketone, chlorinated hydrocarbons, such as methylene chloride, and amides, such as dimethylformamide. Where the additives themselves are liquid, they can also be incorporated into the photographic material without the assistance of solvents.

The novel compounds of the formula (I) may if desired be dispersed in the gelatine layer without oil, as described Research Disclosure, Items 296017 (1988) and 303070 (1989).

The photographic layers in the material of this invention may also include UV absorbers, which screen out the UV light and therefore protect the dyes, the couplers or other components against photodegradation. Benzofuran-2-ones compounds according to this invention may be contained in those layers where UV absorbers are present.

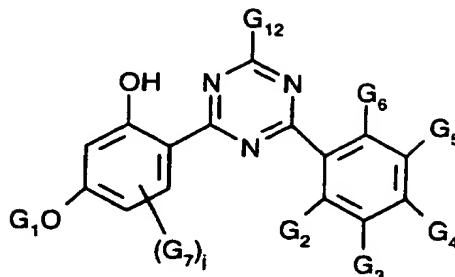
UV absorbers preferably to be used in the novel material or within the process of present invention include benzotriazoles, 2-hydroxybenzophenones, oxanilides, cyanoacrylates, salicylic esters, acrylonitrile derivatives, thiazolines and 2-hydroxyphenyltriazines.

Such UV absorbers are described in more detail, for example, in the following publications: DE 19750906, US-A-3,314,794, 3,352,681, 3,705,805, 3,707,375, 4,045,229, 3,700,455, 3,700,458, 3,533,794, 3,698,907, 3,705,805, 3,738,837, 3,762,272, 4,163,671, 4,195,999, 4,309,500, 4,431,726, 4,443,543, 4,576,908, 4,749,643, 4,826,978, 5,500,332, 5,455,152, 5,300,414, 5,489,503, 5,480,108, 5,364,749, GB-A-1,564,089, GB-A-2,293,608, EP-A-190003, -747755, -717313 and JP-A-71/2784, 81/111,826, 81/27,146, 88/53,543, 88/55,542 and 96/69087.

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Examples of particularly suitable UV absorbers are:

2-Hydroxyphenyltriazines of the formula



in which j is 0, 1, 2 or 3;

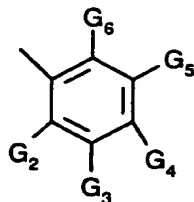
G_1 is alkyl, alkenyl or cycloalkyl;

G_2 and G_6 independently of one another are H, OH, halogen, alkyl, alkoxy, halomethyl, for example CF_3 ;

G_3 , G_5 and G_7 independently of one another are H, OH, OG_1 , halogen, alkyl, halomethyl, for example CF_3 ;

G_4 is H, OH, OG_1 , halogen, alkyl, phenyl, halomethyl, for example CF_3 , or alkenyl; and

G_{12} is alkyl, phenylalkyl, cycloalkyl, OG_1 , or in particular, a group of the formula

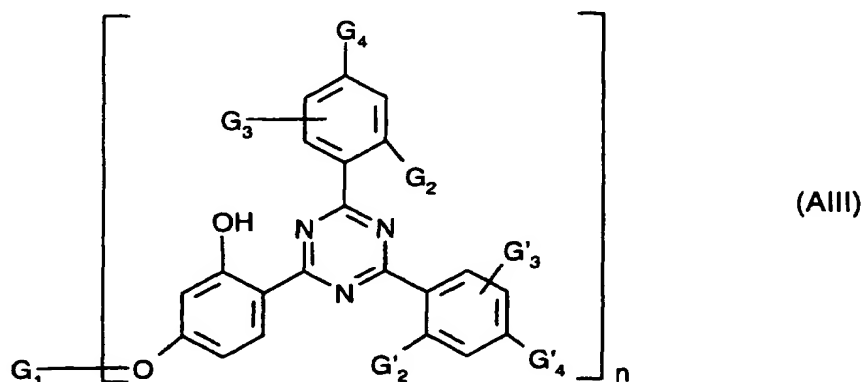


Alkyl or alkenyl substituents, or substituents which are aromatic or aliphatic ring systems, usually contain - within the context of the stated definitions - from 1 to 50 carbon atoms and can be interrupted one or more times by O, S, NR' , SO_2 , CO, phenylene, cyclohexylene, COO, OCO, $-(SiR_pR_qO)-$ and/or substituted one or more times by OH, OR' , $NR'R''$, halogen, -CN, alkenyl, phenyl, $-SiR_pR_qR_r$ or COOH, where R' and R'' independently of one another are H, alkyl, alkenyl or acyl, and R_p , R_q and R_r independently of one another are H, alkyl, alkenyl, phenyl, alkoxy, acyl or acyloxy.

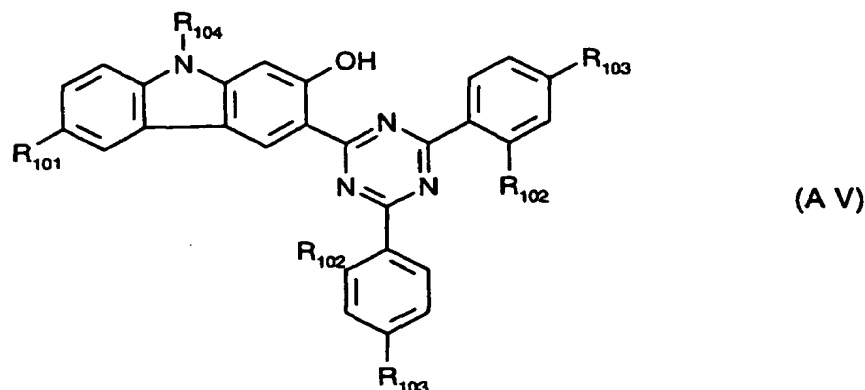
The abovementioned groups can also carry other substituents as well. Dimers or polymers are also possible.

Preferred 2-hydroxyphenyltriazines of this class are, for example, those of the formula

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or



where, in formula AIII

n is 1 or 2 and

G_1 , if $n = 1$, is alkyl which is uninterrupted and unsubstituted or is interrupted by one or more O and/or substituted by one or more of the radicals OH, glycidyloxy, alkenoxy, COOH, COOR^e, O-CO-R^f, or is alkenyl, cycloalkyl, unsubstituted or OH-, Cl- or CH₃-substituted phenylalkyl; or COR^e; SO₂-R^h; CH₂CH(OH)-Rⁱ; where

R^e is alkyl; alkenyl; hydroxyalkyl; alkyl or hydroxyalkyl interrupted by one or more O; cycloalkyl; benzyl; alkylphenyl; phenyl; phenylalkyl; furfuryl; or CH₂CH(OH)-Rⁱ;

R^f, R^g independently of one another are alkyl, alkenyl or phenyl;

R^h is alkyl, aryl or alkylaryl;

Rⁱ is aralkyl or CH₂OR^k;

R^k is cyclohexyl, phenyl, tolyl or benzyl; and

G_1 , if $n = 2$, is alkylene; alkenylene; xylylene; alkylene or hydroxyalkylene interrupted by one or more O; hydroxyalkylene;

G_2 and G'_2 independently of one another are H, alkyl, alkoxy or OH;

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G_4 and G'_4 independently of one another are H, alkyl, OH, alkoxy, halogen, and, if $n = 1$, OG_1 ;

G_3 and G'_3 independently of one another are H, alkyl or halogen; and
where, in formula AV,

R_{101} is H, C_1 - C_8 alkyl, C_1 - C_8 alkoxy;

R_{102} and R_{103} independently of one another are H, halogen, OH, C_1 - C_8 alkyl, C_1 - C_8 alkoxy;

R_{104} is H, OH, C_1 - C_8 alkyl; C_1 - C_8 alkoxy.

Within the scope of the stated definitions G_1 , G_2 , G'_2 , G_3 , G'_3 , G_4 and G'_4 may also carry additional substituents, for example an ethylenically unsaturated, polymerizable group. Dimers or polymers are also possible.

Particular preference is given to colour photographic materials in accordance with the present invention, in which at least one of the layers comprises a UV absorber of the formula A III in which

n is 1;

G_1 is C_1 - C_{12} alkyl which is unsubstituted or substituted by OH or $COOR^e$; or is C_2 - C_{12} alkyl or C_3 - C_{15} hydroxyalkyl, interrupted by one or more O; or is C_3 - C_6 alkenyl; cyclohexyl; C_7 - C_{11} phenylalkyl; $CH_2CH(OH)-R^i$; where

R^e is C_1 - C_{18} alkyl; C_3 - C_7 alkenyl; alkyl or hydroxyalkyl interrupted by one or more O;

R^i is C_7 - C_{12} alkyl or CH_2OR^k ;

R^k is cyclohexyl, phenyl, tolyl or benzyl; and

G_2 and G'_2 are OH or alkoxy;

G_4 and G'_4 are OG_1 ;

G_3 and G'_3 independently of one another are H or methyl;
especially those in which

n is 1;

G_1 is C_1 - C_{12} alkyl which is unsubstituted or substituted by $COOR^e$; or is C_3 - C_{15} hydroxyalkyl which is interrupted by O; or is allyl, cyclohexyl or benzyl; where

R^e is C_1 - C_{12} alkyl; allyl; C_3 - C_{12} alkyl which is interrupted by one or more O;

G_2 and G'_2 are OH or alkoxy;

G_4 and G'_4 are OG_1 ;

G_3 and G'_3 are H.

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Examples of such compounds include

2,4,6-tris(2-hydroxy-4-octyloxyphenyl)-1,3,5-triazine,

2-(2,4-dihydroxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine,

2,4-bis(2-hydroxy-4-propyloxyphenyl)-6-(2,4-dimethylphenyl)-1,3,5-triazine,

2-(2-hydroxy-4-octyloxyphenyl)-4,6-bis(4-methylphenyl)-1,3,5-triazine,

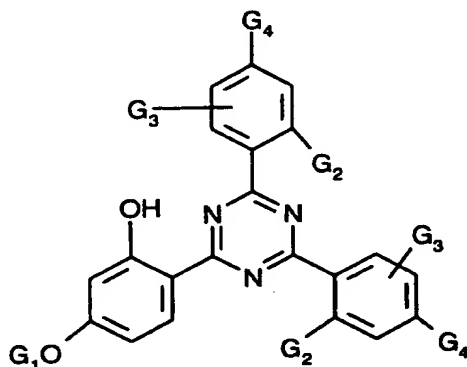
2-(2-hydroxy-4-dodecyloxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine,

2-[2-hydroxy-4-(2-hydroxy-3-butyloxypropyloxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine,

2-[2-hydroxy-4-(2-hydroxy-3-octyloxypropyloxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine,

2-[2-hydroxy-4-(2-hydroxy-3-tridecyloxypropyloxy)phenyl]-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine; and compounds of the following formulae:

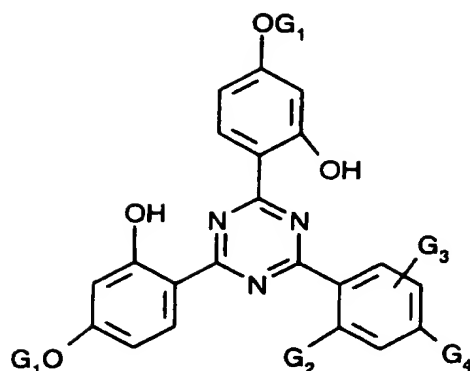
Type (HPT-I)



No.	G ₁	G ₂	G ₄	G ₃
HPT-1	CH ₂ CH(OH)CH ₂ O-CO-C(CH ₃)=CH ₂	CH ₃	CH ₃	H
HPT-2	CH ₂ CH(OH)CH ₂ OC ₁₂ H ₂₅ /C ₁₃ H ₂₇ (mixture)	CH ₃	CH ₃	H
HPT-3	CH ₂ CH(OH)CH ₂ O-C ₄ H ₉ (n)	CH ₃	CH ₃	H
HPT-4	CH ₂ COO-C ₁₈ H ₃₇	H	H	m-CF ₃
HPT-5	C ₈ H ₁₇	CH ₃	CH ₃	H
HPT-6	CH ₂ CH(OH)CH(C ₂ H ₅)-C ₄ H ₉ (n)	CH ₃	CH ₃	H
HPT-7	H	CH ₃	CH ₃	H
HPT-8	CH ₂ CH ₂ OH	H	H	H
HPT-9	C ₈ H ₁₇	H	H	H

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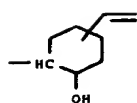
Type (HPT-II)



No.	G ₁	G ₂	G ₄	G ₃
HPT-10	C ₁₈ H ₃₇	CH ₃	CH ₃	o-CH ₃
HPT-11	CH ₂ CH(OH)CH ₂ O-C ₄ H ₉ (n)	H	H	H
HPT-12	CH ₂ CH(OH)CH ₂ O-C ₄ H ₉ (n)	CH ₃	CH ₃	H
HPT-13	CH ₂ CH(OH)CH ₂ O-C ₄ H ₉ (n)	CH ₃	CH ₃	o-CH ₃
HPT-14	CH ₂ CH(OH)-C ₄ H ₉ (n)	CH ₃	CH ₃	o-CH ₃
HPT-15	CH(OH)-C ₅ H ₁₁ (n)	CH ₃	CH ₃	o-CH ₃
HPT-16	C ₈ H ₁₇	H	Cl	H
HPT-17	CH(CH ₃)-COO-C ₂ H ₅	CH ₃	CH ₃	o-CH ₃
HPT-18	CH ₂ CH(OCOCH ₃)CH(C ₂ H ₅)-C ₄ H ₉ (n)	H	H	H
HPT-19	CH ₂ CH(OH)CH(C ₂ H ₅)-C ₄ H ₉ (n)	H	H	H
HPT-20	CH ₂ CH ₂ -O-CO-C(CH ₃) ₃	H	H	H
HPT-21	H	H	H	H
HPT-22	(CH ₂) ₁₀ COO-C ₂ H ₅	H	Cl	H
HPT-23	(CH ₂) ₅ COOH	H	H	H
HPT-24	CH ₂ CH(C ₂ H ₅)-C ₄ H ₉ (n)	H	H	H
HPT-25	CH ₂ CH(OH)CH ₂ -O-C ₄ H ₉ (n)	H	t-C ₄ H ₉	H
HPT-26	CH ₂ CH(OH)CH ₂ -O-C ₄ H ₉ (n)	H	OCH ₃	H
HPT-27	(CH ₂) ₃ -Si(CH ₃) ₃	H	H	H
HPT-28	CH ₂ -CH(OH)-CH ₂ -O-C ₄ H ₉ -n	OCH ₃	OG ₁	H
HPT-29	CH ₂ -CH(OH)-CH ₂ -O-C ₄ H ₉ -n	OC ₂ H ₅	OG ₁	H
HPT-30	CH ₂ -CH(OH)-CH ₂ -O-C ₄ H ₉ -n	OG ₁	OG ₁	H
HPT-31	CH(CH ₃)-CO-O-C ₂ H ₅	OC ₂ H ₅	OG ₁	H
HPT-32	CH(CH ₃)-CO-O-C ₂ H ₅	OG ₁	OG ₁	H

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HPT-33

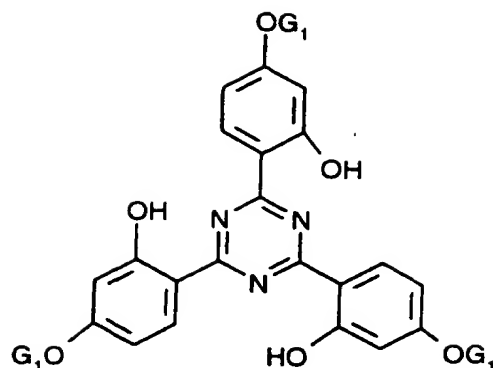


(mixture of 4-vinyl- and 5-vinyl-2-hydroxy-cyclohexyl)

		OCH ₃	OG ₁	H
HPT-34	C ₂ H ₅	OG ₁	OG ₁	H
HPT-35	CH ₂ -CH(C ₂ H ₅)-C ₄ H ₉ -n	OG ₁	OG ₁	H
HPT-36	(CH ₂) ₇ -CH ₃	OG ₁	OG ₁	H
HPT-37	n-propyl	OCH ₃	OG ₁	H
HPT-38	n-propyl	O C ₂ H ₅	OG ₁	H
HPT-39	n-propyl	OG ₁	OG ₁	H
HPT-40	iso-propyl	OCH ₃	OG ₁	H
HPT-41	iso-propyl	OC ₂ H ₅	OG ₁	H
HPT-42	iso-propyl	OG ₁	OG ₁	H
HPT-43	n-butyl	OCH ₃	OG ₁	H
HPT-44	n-butyl	OC ₂ H ₅	OG ₁	H
HPT-45	n-butyl	OG ₁	OG ₁	H
HPT-46	CH(CH ₃)C ₂ H ₅	OCH ₃	OG ₁	H
HPT-47	CH(CH ₃)C ₂ H ₅	OC ₂ H ₅	OG ₁	H
HPT-48	CH(CH ₃)C ₂ H ₅	OG ₁	OG ₁	H
HPT-49	n-hexyl	OCH ₃	OG ₁	H
HPT-50	n-hexyl	OC ₂ H ₅	OG ₁	H
HPT-51	n-hexyl	OG ₁	OG ₁	H
HPT-52	n-octyl	OCH ₃	OG ₁	H
HPT-53	n-octyl	OC ₂ H ₅	OG ₁	H
HPT-54	n-octyl	OG ₁	OG ₁	H
HPT-55	CH ₂ CH(CH ₃) ₂	OG ₁	OG ₁	H
HPT-56	CH ₂ CH ₂ CH(CH ₃) ₂	OG ₁	OG ₁	H
HPT-57	CH ₂ -COO-Et	OC ₂ H ₅	OG ₁	H
HPT-58	CH ₂ -COO-Et	OG ₁	OG ₁	H

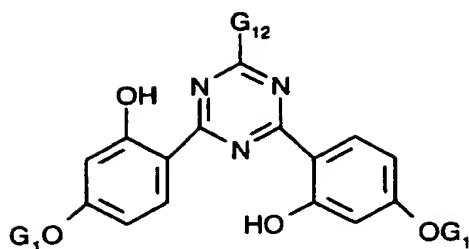
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Type (HPT-III)



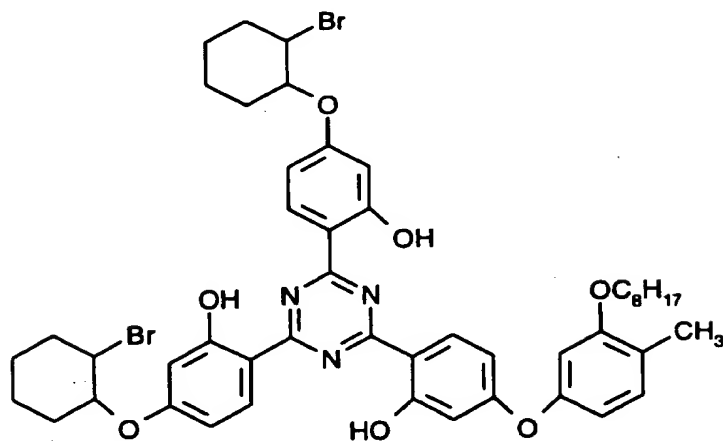
No.	G ₁
HPT-59	cyclohexyl
HPT-60	(mixture of 4-vinyl- and 5-vinyl-2-hydroxy-cyclohexyl)
HPT-61	CH ₂ CH(OH)CH ₂ -O-2-butyl/2-pentyl (mixture)
HPT-62	CH ₂ CH(OH)CH ₂ -O-C ₄ H ₉ (n)
HPT-63	(CH ₂) ₁₀ COO-C ₂ H ₅
HPT-64	CH ₂ CH(OH)CH(C ₂ H ₅)-C ₄ H ₉ (n)
HPT-65	C ₄ H ₉
HPT-66	CH ₂ CH(OH)CH ₂ -O-ethyl/isopropyl/C ₄ H ₉ (n) (mixture)
HPT-67	CH(C ₃ H ₇) ₂
HPT-68	cyclopentyl
HPT-69	CH ₂ CH(OH)CH ₂ -O-CH ₂ CH ₂ -O-CH(CH ₃)C ₂ H ₅
HPT-70	
HPT-71	
HPT-72	C(CH ₃) ₂ -COO-C ₂ H ₅
HPT-73	CH(CH ₃)-COO-C ₂ H ₅
HPT-74	CH ₂ CH(OH)CH ₂ -O-CH(CH ₃)-C ₂ H ₅ /C ₃ H ₇
HPT-75	(CH ₂) ₅ -CH ₃

Type (HPT-IV)

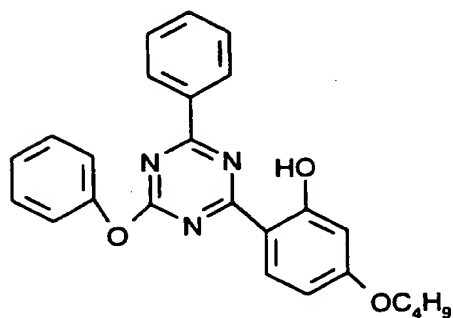


and

HPT-81

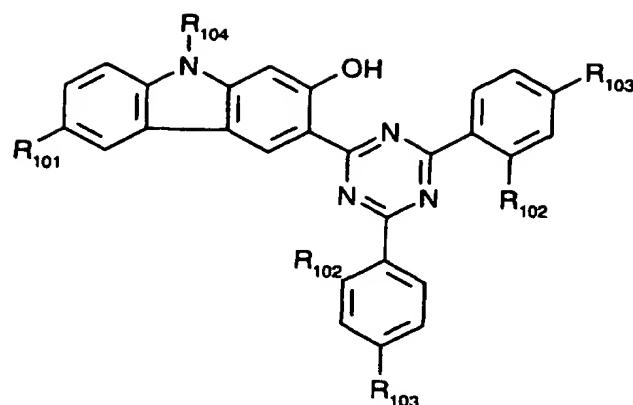


HPT-82



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Type (HPT-V)

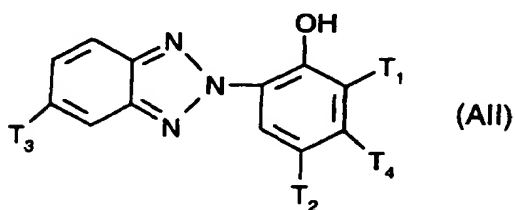


No.	R ₁₀₁	R ₁₀₂	R ₁₀₃	R ₁₀₄
HPT-83	H	H	H	H
HPT-84	H	CH ₃	CH ₃	H
HPT-85	H	OH	H	H
HPT-86	H	OH	H	CH ₃
HPT-87	H	OCH ₃	OCH ₃	H
HPT-88	CH ₃	H	H	H

Abbreviations used in above formulae:

i = isomer mixture; n = straight-chain radical; t = tertiary radical; o-, m- and p- denote the position of the radical relative to the triazine ring.

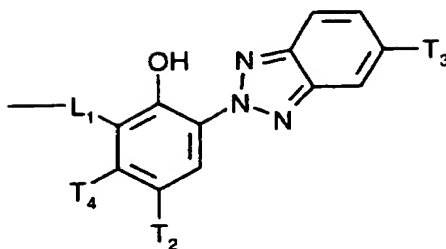
Benzotriazole compounds of the formula All



in which T₁ and T₂ independently of one another are hydrogen, halogen, alkyl, alkyl substituted by COOT₅, alkoxy, aryloxy, hydroxyl, aralkyl, aryl or acyloxy, where T₅ is alkyl or alkyl interrupted by one or more O,

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or T_1 is a group of the formula



in which L_1 is a bivalent

group, for example $-(CH_2)_n-$ where n is from the range 1-8,

T_3 is hydrogen, halogen, alkyl, alkoxy, aryloxy, acyloxy; $-CF_3$, phenyl, $-S-T_6$, $-SO_2-T_6$; and

T_4 is hydrogen, hydroxyl, alkoxy, aryloxy or acyloxy or a group of one of the formulae -
 $OCH_2CH(OT_8)-CH_2-O-T_7$ or $-OCH_2CH_2-O-CO-T_7$;

T_6 is alkyl or aryl;

T_7 is alkyl or aryl;

T_8 is hydrogen or $CO-T_9$;

T_9 is alkyl or alkenyl;

and polymers prepared using these compounds. Preference is given to those compounds of the formula A II which are liquid in the temperature range around $20^\circ C$ or form a liquid phase in a mixture with other substances, especially to those in which

T_1 and T_2 , independently of one another are hydrogen, halogen, alkyl, alkyl substituted by $COOT_5$, alkoxy, aryloxy, hydroxyl, aralkyl, aryl or acyloxy, where T_5 is alkyl or alkyl which is interrupted by one or more O.

Within the scope of the stated definitions T_1 , T_2 , T_3 and T_4 may also carry additional substituents, for example an ethylenically unsaturated, polymerizable group. Dimers or polymers are also possible.

Especial preference is given to those compounds of the formula AII, in which

T_1 is H, C_1-C_{12} alkyl, 1,1-dimethylbenzyl;

T_2 is H, C_1-C_{12} alkyl, 1,1-dimethylbenzyl or $CH_2CH_2COOT_5$;

T_3 is chlorine, CF_3 , $-S-T_6$, $-SO_2-T_6$;

T_4 is hydrogen or C_1-C_{18} alkoxy;

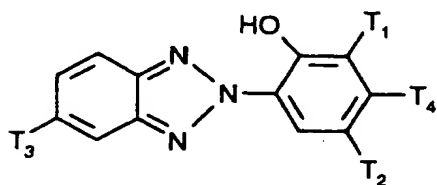
T_5 is C_1-C_{18} alkyl, or C_3-C_{18} alkyl interrupted by one or more O; and



T_6 is phenyl.

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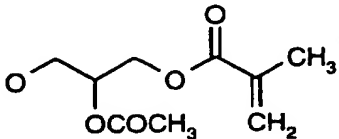
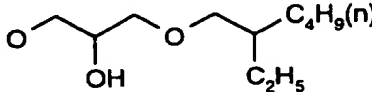
The radicals designated as alkyl, alkenyl, aryl, arylalkyl, acyl, alkyloxy, alkenyloxy, aryloxy, arylalkyloxy and acyloxy for the conventional UV absorbers are generally those which are common in the art; preferred radicals are generally - as regards chain length, number of carbon atoms and any heteroatoms etc. - of the type as defined above for the novel compounds of the formula (I).

Examples of benzotriazoles (HBT) of the formula All are:



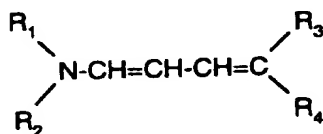
HBT-No.	T ₁	T ₂	T ₃	T ₄
HBT-1	H	CH ₃	H	H
HBT-2	H	C(CH ₃) ₃	H	H
HBT-3	C(CH ₃) ₃	CH ₃	Cl	H
HBT-4	C(CH ₃) ₃	C(CH ₃) ₃	Cl	H
HBT-5	C(CH ₃) ₂ C ₂ H ₅	C(CH ₃) ₂ C ₂ H ₅	H	H
HBT-6	CH(CH ₃)C ₂ H ₅	C(CH ₃) ₃	H	H
HBT-7	C(CH ₃) ₂ - 	C(CH ₃) ₂ - 	H	H
HBT-8	C(CH ₃) ₃	CH ₂ CH ₂ COOC ₈ H ₁₇ (isomers) [*]	Cl	H
HBT-9	C(CH ₃) ₃	CH ₂ CH ₂ COOC ₈ H ₁₇ (isomers) [*]	H	H
HBT-10	C ₁₂ H ₂₅ (isomers) [*]	CH ₃	H	H

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HBT-11	$\text{C}(\text{CH}_3)_2$ - 	$-\text{C}(\text{CH}_3)_2-\text{C}(\text{CH}_3)_3$	H	H
HBT-12	H	H	H	$\text{O}(\text{CH}_2)_2-\text{O}-\text{CO}-\text{C}(\text{CH}_3)=\text{CH}_2$
HBT-13	H	H	Cl	
HBT-14	H	H	H	
HBT-15	sec-C ₄ H ₉	sec-C ₄ H ₉	Cl	H

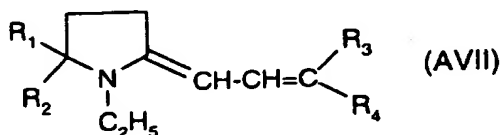
 main product

Other suitable UV absorbers are those of the formula AVI, AVII and AVIII

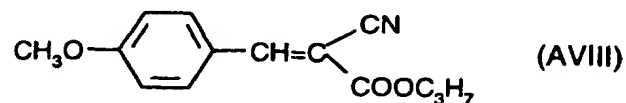


(AVI)

in which

 $\text{R}_1, \text{R}_2 = -\text{C}_6\text{H}_{13}(\text{n}); \text{R}_3, \text{R}_4 = -\text{CN}$
 $\text{R}_1, \text{R}_2 = -\text{C}_2\text{H}_5; \text{R}_3 = -\text{SO}_2-\text{C}_6\text{H}_5; \text{R}_4 = -\text{CO}-\text{OC}_8\text{H}_{17}$
 $\text{R}_1, \text{R}_2 = -\text{C}_2\text{H}_5; \text{R}_3 = -\text{SO}_2-\text{C}_6\text{H}_5; \text{R}_4 = -\text{COO}-\text{C}_{12}\text{H}_{25}$
 $\text{R}_1, \text{R}_2 = -\text{CH}_2=\text{CH}-\text{CH}_2; \text{R}_3, \text{R}_4 = -\text{CN}$ 

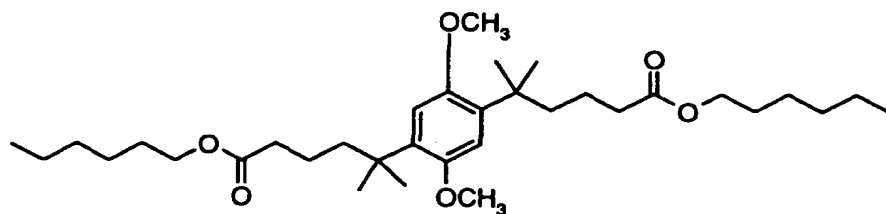
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 $R_1, R_2 = H; R_3 = -CN; R_4 = -CO-NHC_{12}H_{25}$ $R_1, R_2 = -CH_3; R_3 = -CN; R_4 = -CO-NHC_{12}H_{25}$ 

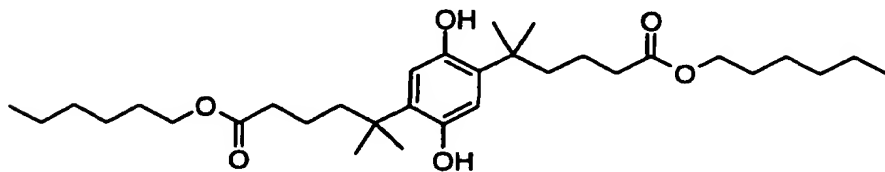
Other substances which can be used as light or dark stabilizers are described in US-A-5,580,710 or US-A-5,543,276.

Examples of particularly suited stabilizers for the colour couplers and resulting dyes which can be employed in the novel material are:

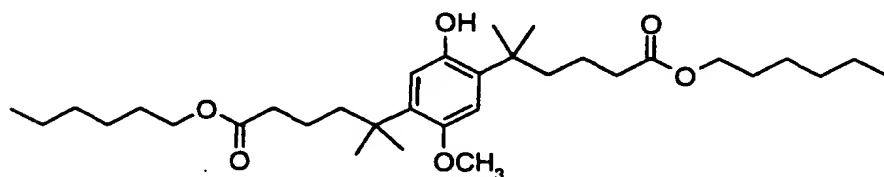
(ST-1)



(ST-2)

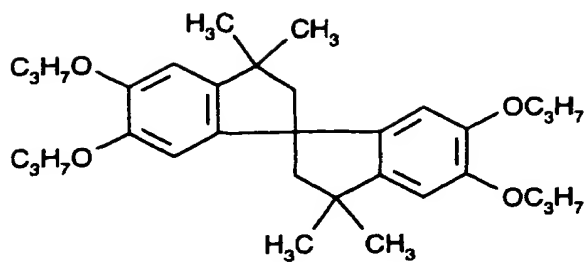


(ST-3)

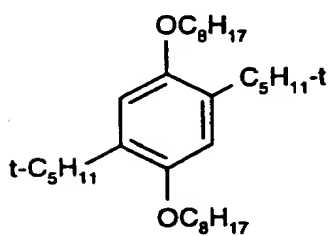


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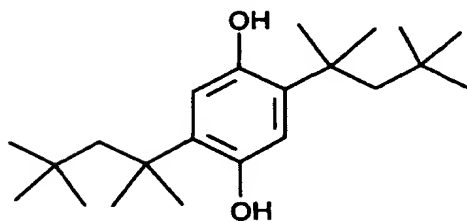
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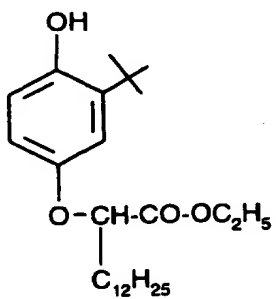
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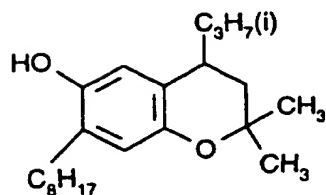
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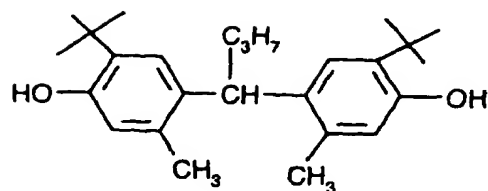
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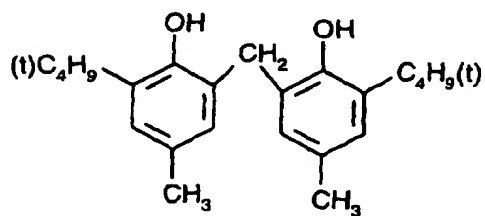
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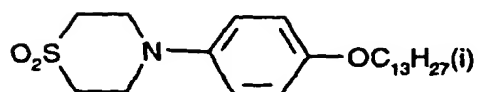
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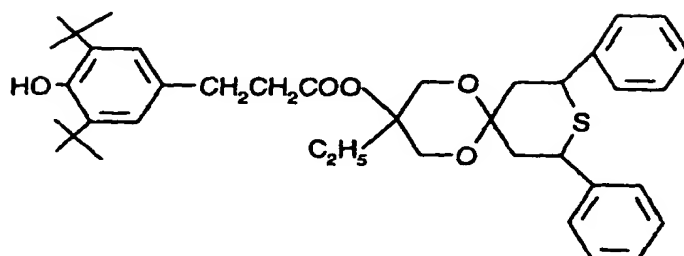
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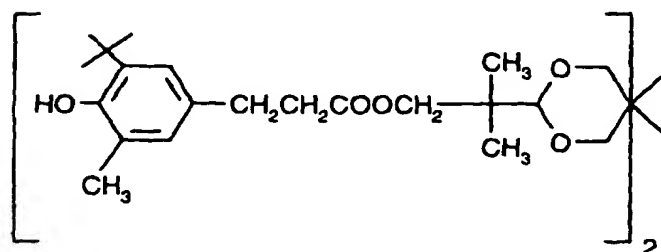
(ST-11)



(ST-12)

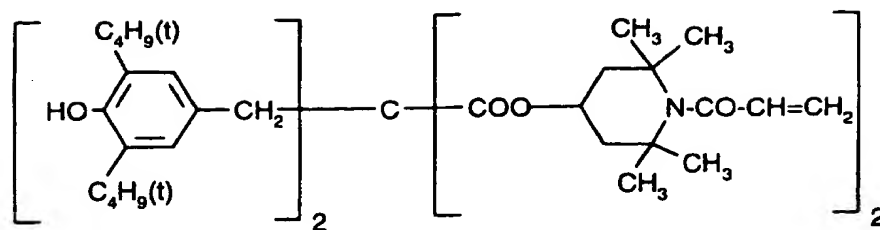


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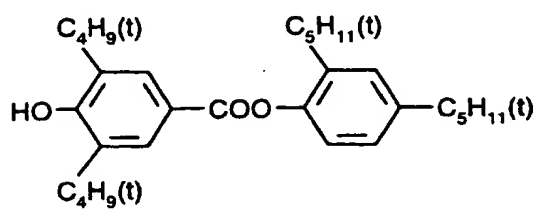


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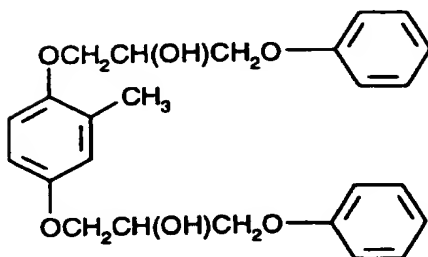
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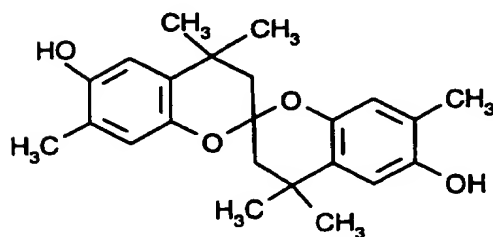
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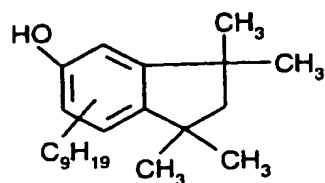
(ST-16)



(ST-17)

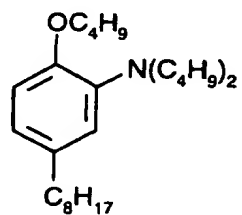


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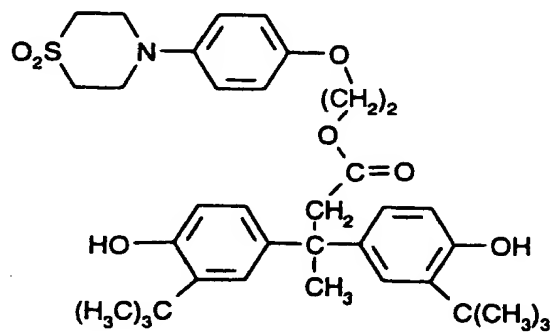


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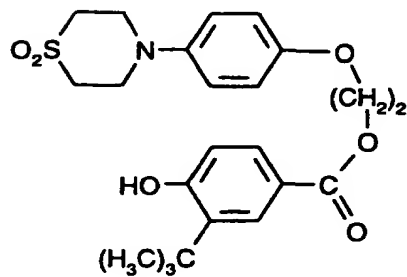
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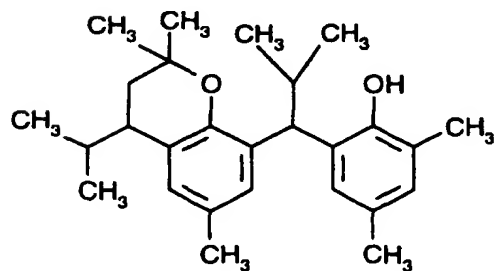
(ST-20)



(ST-21)

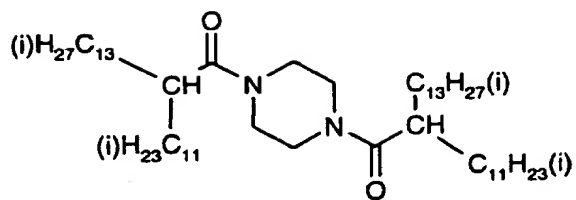


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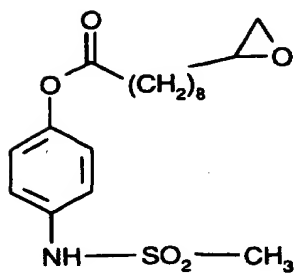


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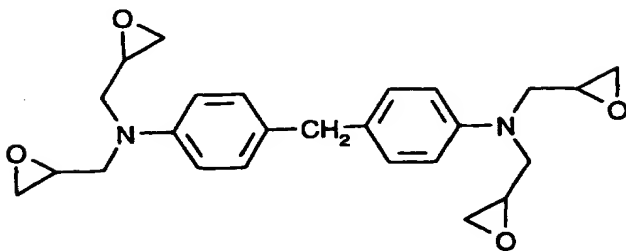
(ST-23)



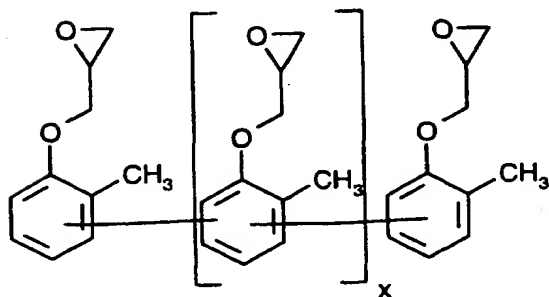
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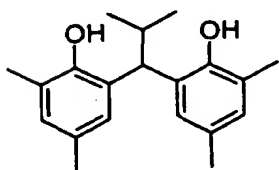
(ST-25)



(ST-26)

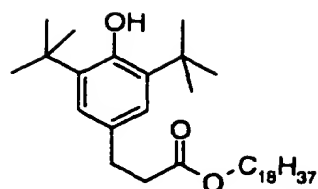


(ST-27)

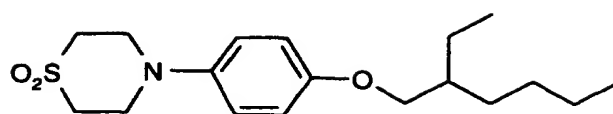


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(ST-28)

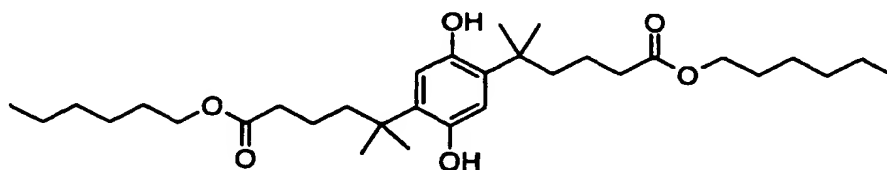


(ST 29)

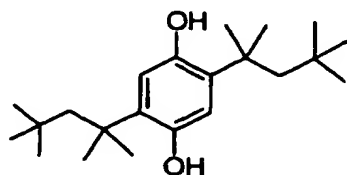


The compounds of formula I may be used in combination with any known Dox scavengers such as hydrazines, hydrazides, hydroquinones of e.g. formula A-1 or A-2, 6-hydroxychromans of e.g. formula A-3 or hydroxylamines of e.g. formula A-4:

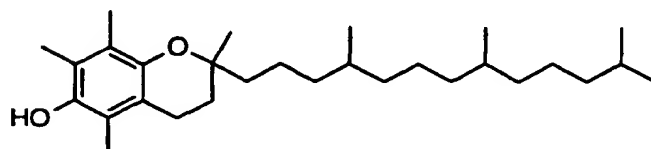
A-1



A-2

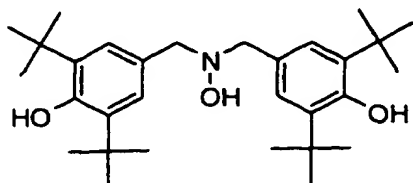


A-3



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A-4



As silver halide emulsions it is possible to use customary silver chloride, silver bromide or silver iodide emulsions or mixtures thereof, such as silver chlorobromide and silver chloroiodide emulsions, in which the silver halides may have all known crystal forms. The use of silver chloride emulsions is accorded particular importance in the material of this novel process. The preparation of such emulsions and their sensitization are described in research disclosure, Item 307105, November 1989.

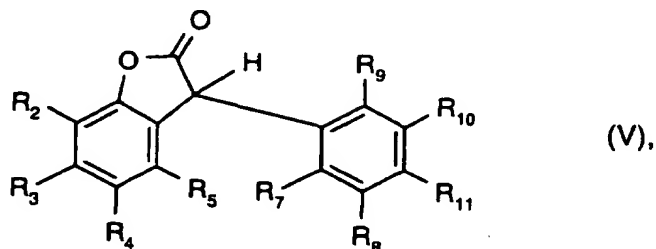
The silver halide emulsion which can be used to implement this invention can be sensitized for all desired wavelengths, with the aid of sensitizing dyes. Dyes which can be used for this purpose are cyanine dyes, merocyanine dyes, holopolar dyes, hemicyanine dyes, styryl dyes or hemioxonol dyes.

The photosensitive material may include water-soluble filter and antihalation dyes. Dyes which can be used for this purpose are oxonol dyes, hemioxonol dyes, styryl dyes, merocyanine dyes, cyanine dyes, anthraquinone dyes and azo dyes.

Further details on the structure of the colour photographic material of the invention, and the components or further additives which can be employed in the novel material, can be found, inter alia, in US-A-5,538,840, column 27, line 25, to column 106, line 16, and in US-A-5,780,625, column 12, line 6, until column 57, line 6, and the publications cited in these 2 references; these passages of US-A-5,538,840 and US-A-5,780,625 are hereby incorporated by reference. Other useful information, how compounds of the formula I can be used in photographic material, can be taken from DE-A-19749083, page 16, line 35, until page 17, line 45, especially the references cited therein. Further important components, especially couplers, are described in US-5,578,437; GB-A-2319523 describes from page 49, line 21, until page 73, line 2, further details of the colour photographic material, especially couplers (page 52, line 1, until page 56, line 22), UV absorbers (page 56, line 25, until page 68, line 1) and dark stabilisers (page 68, line 2, until page 73, line 2).

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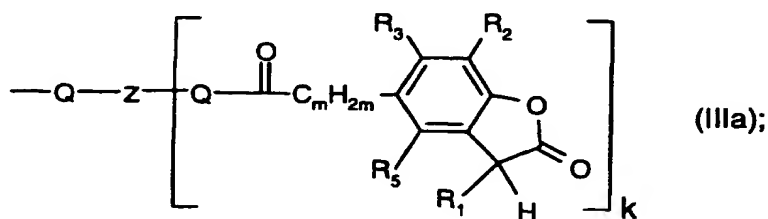
Some of the compounds of the formula I are new compounds. Thus, this invention also pertains to a compound of the formula V



wherein

R_4 is $-(CH_2)_3-COR'_{15}$ or $-C_pH_{2p}-COR_{15}$ or $-C_tH_{2t}-COR_{15}$, wherein the alkylene moiety C_pH_{2p} is branched alkylene and the alkylene moiety C_tH_{2t} is a straight chain or branched alkylene moiety;

R_{15} is hydroxy, $\left[-O^- \frac{1}{r} M^{r+}\right]$, C_1-C_{20} alkoxy, $-N \begin{smallmatrix} R_{24} \\ R_{25} \end{smallmatrix}$, or a group of the formula IIIa



R'_{15} is a group of formula IIIa;

Q is oxygen or $-NH-$,

Z is a linking group of valency $(k+1)$ and is as a divalent group C_2-C_{12} alkylene, Q-interrupted C_4-C_{12} alkylene, phenylene or phenylene-D-phenylene with D being C_1-C_4 alkylene, O, S, SO or SO_2 ;

Z as a trivalent group is C_3-C_{12} alkanetriyl, a trivalent residue of a hexose or a hexitol, a group, $-(CH_2)_3C-CH_2OH$, or a group $-C_aH_{2a}-N(C_bH_{2b})-C_cH_{2c}-$; and

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Z as a tetravalent group is a tetravalent residue of a hexose or a hexitol, C₄-C₁₂alkanetetryl,



a, b, c and k independently are 1, 2 or 3,

m is 0 or a number from the range 1-12, preferably 1-6,

p is 1 or 2;

s is 1 or 2;

t is a number from the range 3-12, preferably 3-6;

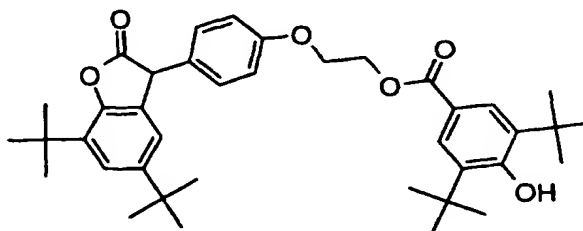
and all other residues are as defined for formula I if n is 1.

Preferred compounds of the formula V are, within the limits given, as defined for formulae I or IV above.

Compounds of the formula V are also useful as stabilisers for organic material against degradation by light, oxygen and/or heat. Application of these compounds and methods of stabilising are generally as described in GB-A-2322861; examples for organic material which can be stabilized are listed, for example, in GB-A-2319523 from page 15, line 11, until page 20, line 25; possible costabilizers are as listed, for example, in GB-A-2319523 from page 21, line 16, until page 32, bottom line. Compounds of the formula V are used for this application preferably in an amount of 0.0005 to 5%, based on the weight of the organic material to be stabilised.

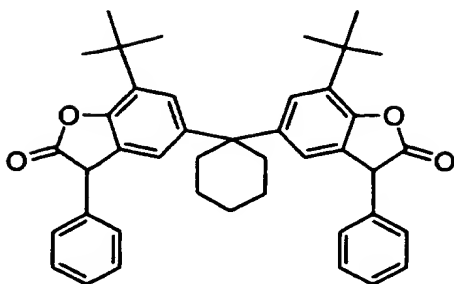
Examples for compounds of the formula I to be used within this invention are:

Compound 1^{a)}:

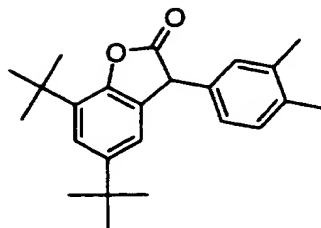


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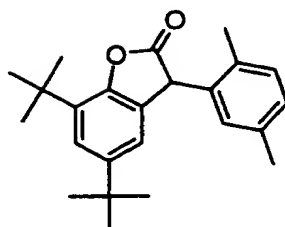
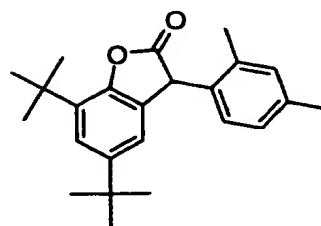
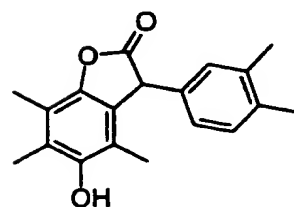
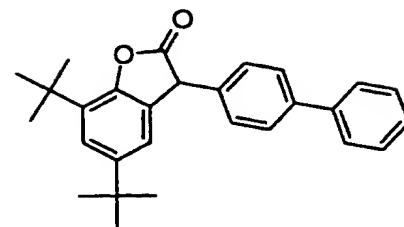
Compound 2:



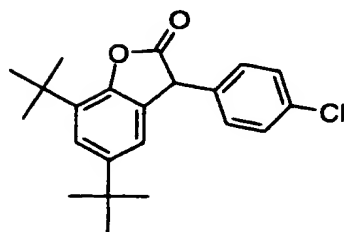
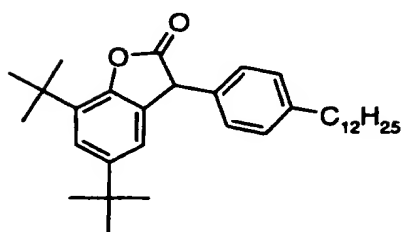
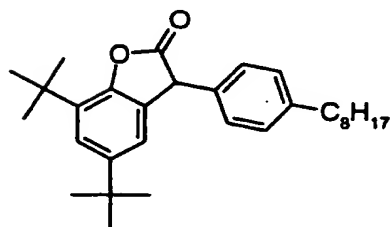
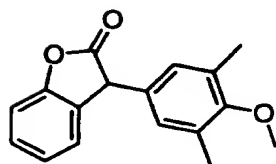
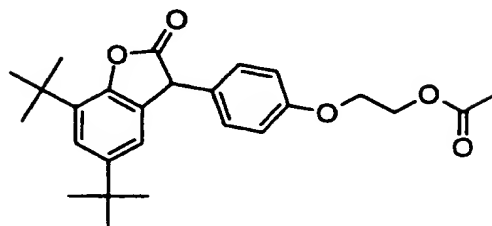
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Compound 7^{a)}:

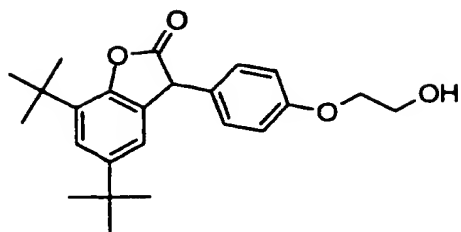
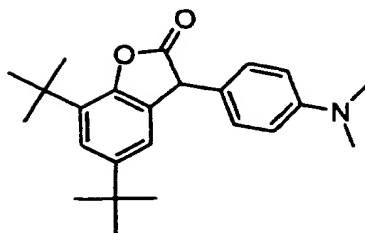
Compound 8:

Compound 9^{a)}:Compound 10^{a)}:Compound 11^{a)}:

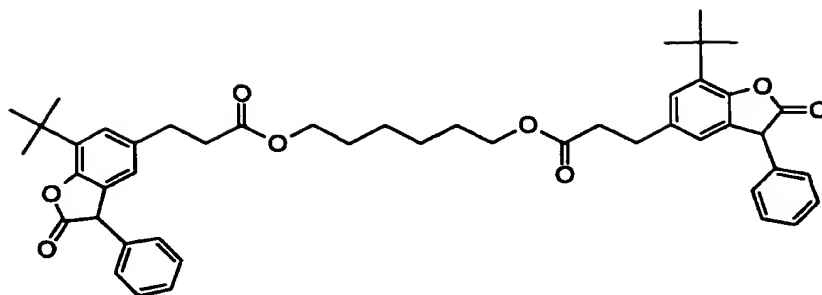
- 81 -

Compound 12^{a)}:Compound 13^{a)}:Compound 14^{a)}:Compound 15^{a)}:Compound 16^{a)}:

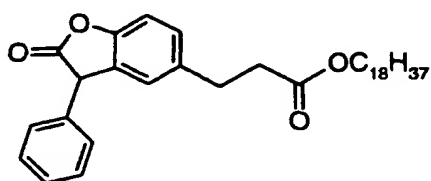
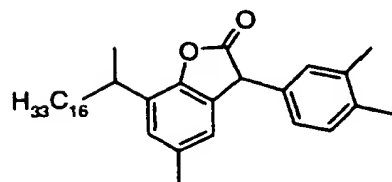
- 82 -

Compound 17^{a)}:Compound 18^{a)}:

Compound 19:

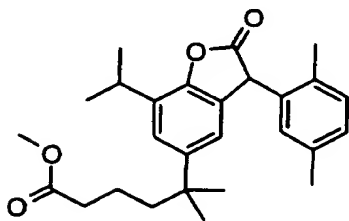
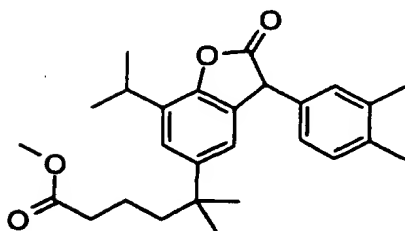


Compound 20:

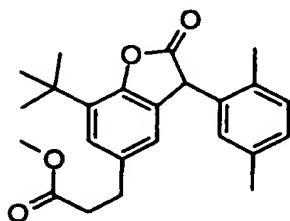
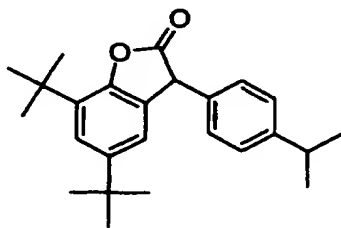
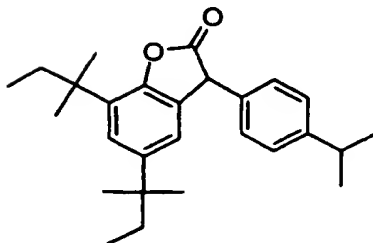
Compound 21^{a)}:

- 83 -

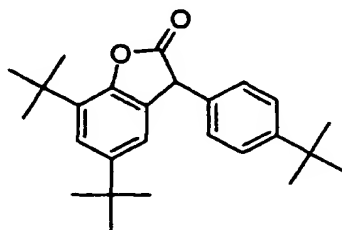
Compound 22:

Compound 23^{a)}:

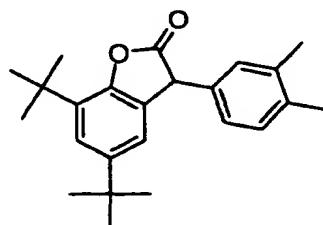
Compound 24:

Compound 25^{a)}:Compound 26^{a)}:

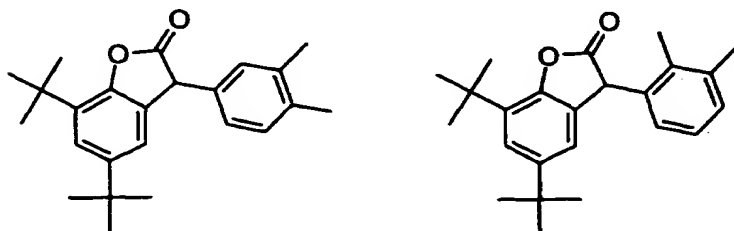
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Compound 27^{a)}:

Compound 28:



a) The product may additionally contain minor amounts of other structural isomers in accordance with the substitution at the phenyl ring in 3-position of the benzofuran-2-one. For example, compound 7 comprises the 2 isomers



The synthetic methods used for the preparation of the benzofuran-2-ones shown above are described e.g. in US Patent 5,516,920.

Example 1

To evaluate compounds of this invention with respect to their ability as interlayer scavengers for oxidised developing agent, three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

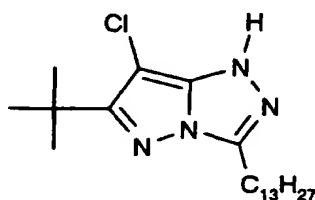
Test element 1 (reference sample)

(1) A layer containing :

- 85 -

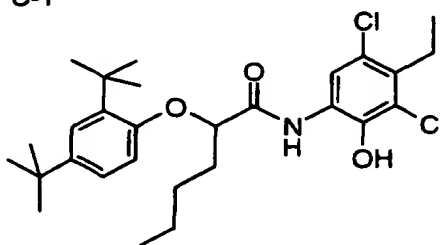
- 1800 mg.m⁻² of gelatin
 - 180 mg.m⁻² of dibutylphthalate
 - 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- (2) An interlayer containing :
- 1800 mg.m⁻² of gelatin
 - 300 mg.m⁻² of tricresylphosphate
 - 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- (3) A photosensitive layer containing :
- 260 mg.m⁻² (based on silver) of an unsensitized silver bromide emulsion
 - 1800 mg.m⁻² of gelatin
 - 300 mg.m⁻² of magenta-dye-forming coupler M-1
 - 300 mg.m⁻² of tricresylphosphate
 - 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
 - 2-hydroxy-4,6-dichloro-1,3,5-triazine, potassium salt hardener
 - 7-methyl-5-hydroxy-1,3,8-triazaindolizine antifoggant.

M-1

**Test element 2 (check sample)**

- (1) A layer containing :
- 1800 mg.m⁻² of gelatin
 - 272 mg.m⁻² of cyan-dye-forming coupler C-1
 - 180 mg.m⁻² of dibutylphthalate
 - 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- (2) An interlayer having the same composition as the interlayer of test element 1
- (3) A photosensitive layer having the same composition as the photosensitive layer of test element 1.

C-1

**Test elements 3-8**

- (1) A layer having the same composition as the first layer of test element 2
- (2) An interlayer containing

- 86 -

- 1800 mg.m⁻² of gelatin
- 0.056x10⁻³ mol.m⁻² of oxidised developer scavenger as indicated in table 1 below
- 300 mg.m⁻² of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(3) A photosensitive layer having the same composition as the photosensitive layer of test element 1.

The test elements are imagewise exposed through a step wedge with density increment 0.15 and thereafter subjected to the AGFA P-94 developing process.

Within test elements 2-9, cyan dye can only be formed by the wandering of the oxidised developer from the layer in which it is formed (i.e. the uppermost layer) to the bottom layer containing the cyan-dye-forming coupler. The ability of an interlayer scavenger to prevent oxidised developer from diffusing into the bottom layer can thus be assessed by determining the red density at any chosen exposure amount.

The red density at the exposure amount giving a green density of 2 is reported in table 1. The red density in the test element containing no cyan coupler in the bottom layer (test element 1) arises exclusively from the side absorption of the magenta dye in the red part of the visible spectrum.

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Table 1

Test element	Interlayer scavenger	Red density at a green density of 2
1 (reference)	none	0.268
2 (check)	none	0.400
3	Compound 1	0.320
4	Compound 2	0.278
5	Compound 3	0.349
6	Compound 4	0.313
7	Compound 5	0.327
8	Compound 6	0.319

Any red density inferior to that observed in sample 2 indicates scavenging of the oxidised developer. It is thus clear from the data in table 1 that compounds within the scope of this invention are very effective in preventing the oxidised developer from wandering and forming dye in the wrong layer.

Example 2

Three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

Test element 9 (reference sample)

Same as test element 1 of example 1

Test element 10 (check sample)

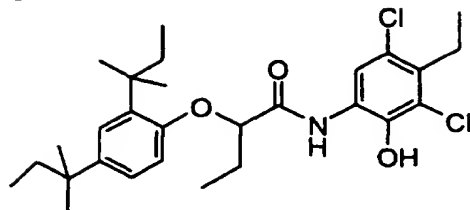
(1) A layer containing :

- 1800 mg.m⁻² of gelatin
- 272 mg.m⁻² of cyan-dye-forming coupler C-2
- 180 mg.m⁻² of dibutylphtalate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(2) An interlayer having the same composition as the interlayer of test element 9

(3) A photosensitive layer having the same composition as the photosensitive layer of test element 9.

C-2



Test elements 11-14

- (1) A layer having the same composition as the first layer of test element 10
- (2) An interlayer containing
 - 1800 mg.m⁻² of gelatin
 - 30 mg.m⁻² of oxidised developer scavenger as indicated in table 2 below
 - 300 mg.m⁻² of tricresylphosphate
 - 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- (3) A photosensitive layer having the same composition as the photosensitive layer of test element 9.

The test elements are exposed and processed in the same manner as in example 1.

The red density at the exposure amount giving a green density of 2 is reported in table 2.

Table 2

Test element	Interlayer scavenger	Red density at a green density of 2
9 (reference)	none	0.264
10 (check)	none	0.372
11	Compound 7	0.284
12	Compound 8	0.308
13	Compound 9	0.300
14	Compound 24	0.302

According to the data in table 2, the compounds of this invention used in the test elements 11-14 are very effective oxidised developer scavengers.

Example 3

Three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

Test element 15 (check sample)**(1) A layer containing :**

- 1800 mg.m⁻² of gelatin
- 272 mg.m⁻² of cyan-dye-forming coupler C-2
- 180 mg.m⁻² of dibutylphthalate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(2) An interlayer containing :

- 1800 mg.m⁻² of gelatin
- 300 mg.m⁻² of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(3) A photosensitive layer containing :

- 260 mg.m⁻² of an unsensitized silver bromide emulsion
- 1800 mg.m⁻² of gelatin
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 2-hydroxy-4,6-dichloro-1,3,5-triazine, sodium salt hardener
- 7-methyl-5-hydroxy-1,3,8-triazaindolizine antifoggant.

Test elements 16-27**(1) A layer having the same composition as the first layer of test element 15****(2) An interlayer containing**

- 1800 mg.m⁻² of gelatin
- 30 mg.m⁻² of oxidised developer scavenger as indicated in table 3 below
- 300 mg.m⁻² of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(3) A photosensitive layer having the same composition as the photosensitive layer of test element 15.

The test elements are given a stepped exposure and processed as in example 1.

Cyan dye formation within the above described test elements will again only result from the wandering of the oxidised developer from the photosensitive layer to the layer containing the cyan-dye-forming coupler. The ability of an interlayer scavenger to prevent oxidised developer from diffusing into the bottom layer can thus be assessed by measuring the red density at any given exposure.

As the above described samples contain no dye-forming coupler in the photosensitive layer, there is almost no consumption of the oxidised developer within the latter and the flux of oxidised developer through the interlayer towards the layer containing the cyan coupler is thus markedly increased as compared to the samples of examples 1 and 2.

In table 3, $(D_{red})_{1.35}$ is the red density at the exposure amount obtained behind the 1.35 density step of the step wedge. With the test elements 1-14, this exposure amount gives a green density of about 1.9. The smaller the $(D_{red})_{1.35}$ value, the more effective the scavenging of the oxidised developer.

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Table 3

Test element	Interlayer Scavenger	(D _{red}) _{1.35}
15 (check)	none	0.405
16	Compound 7	0.282
17	Compound 10	0.250
18	Compound 11	0.309
19	Compound 12	0.292
20	Compound 13	0.318
21	Compound 14	0.324
22	Compound 15	0.335
23	Compound 16	0.300
24	Compound 18	0.314
25	Compound 19	0.335
26	Compound 20	0.344
27	Compound 21	0.314

From the data in table 3, it can be seen again that 3-aryl-3H-benzofuran-2-ones according to this invention exhibit outstanding scavenging ability, as evidenced by much smaller red density values in the test elements 16-27 as compared to the check sample.

Example 4

Three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

Test element 28 (reference sample)

(1) A layer containing :

- 1800 mg.m⁻² of gelatin
- 180 mg.m⁻² of dibutylphthalate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(2) An interlayer containing :

- 1800 mg.m⁻² of gelatin
- 300 mg.m⁻² of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(3) A photosensitive layer containing :

- 260 mg.m⁻² of an unsensitized silver bromide emulsion
- 1800 mg.m⁻² of gelatin
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 2-hydroxy-4,6-dichloro-1,3,5-triazine, sodium salt hardener
- 7-methyl-5-hydroxy-1,3,8-triazaindolizine antifoggant.

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Test element 29 (check sample)

Same as test element 15 of example 3 except that the cyan coupler used was C-1 instead of C-2.

Test elements 30-33

- (1) A layer having the same composition as the first layer of test element 29
- (2) An interlayer containing
 - 1800 mg.m⁻² of gelatin
 - Oxidised developer scavenger as indicated in table 4 below
 - 300 mg.m⁻² of tricresylphosphate
 - 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- (3) A photosensitive layer having the same composition as the photosensitive layer of test element 29.

The test elements are given a stepped exposure and processed as in example 1.

In table 4, $(D_{red})_{1.05}$ is the red density at the exposure amount obtained behind the 1.05 density step of the step wedge. For test elements 1-14, this exposure amount gives a green density of about 2.4. The smaller the $(D_{red})_{1.05}$ value, the more effective the scavenging of the oxidised developer.

Table 4

Test element	Interlayer Scavenger	Concentration	$(D_{red})_{1.05}$
28 (reference)	none	-	0.080
29 (check)	none	-	0.482
30	Compound 7	30 mg.m ⁻²	0.390
31	Compound 7	60 mg.m ⁻²	0.313
32	Compound 7	90 mg.m ⁻²	0.202
33	Compound 7	120 mg.m ⁻²	0.127

From the data in table 4, it can be seen that compound 7 according to this invention effectively prevents the formation of cyan dye, and that the Dox scavenging effect increases in proportion to the amount of added compound.

Example 5

Three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

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Test element 34 (check sample)**(1) A layer containing :**

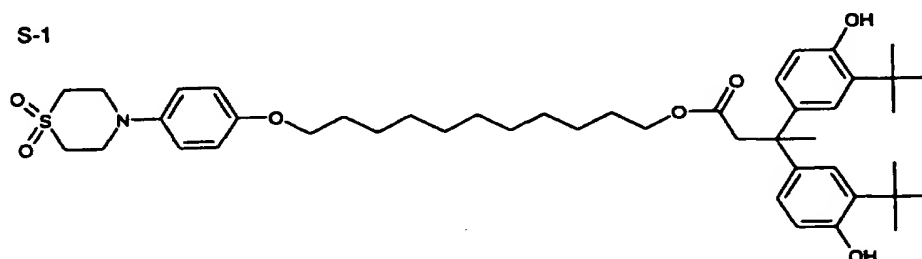
- 1800 mg.m⁻² of gelatin
- 300 mg.m⁻² of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent.

(2) A photosensitive layer containing :

- 260 mg.m⁻² (based on silver) of an unsensitized silver bromide emulsion
- 1800 mg.m⁻² of gelatin
- 300 mg.m⁻² of magenta-dye-forming coupler M-1 (see example 1)
- 225 mg.m⁻² of the magenta dye light stabiliser S-1 (see below)
- 300 mg.m⁻² of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 7-methyl-5-hydroxy-1,3,8-triazaindolizine antifoggant.

(3) A layer containing :

- 1800 mg.m⁻² of gelatin
- 300 mg.m⁻² of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 2-hydroxy-4,6-dichloro-1,3,5-triazine, potassium salt hardener.

**Test elements 35-39****(1) A layer containing :**

- 1800 mg.m⁻² of gelatin
- 80 mg.m⁻² of oxidised developer scavenger as indicated in table 5 below
- 300 mg.m⁻² of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent.

(2) A photosensitive layer having the same composition as the photosensitive layer of test element 34 .

(3) A layer containing :

- 1800 mg.m⁻² of gelatin
- 80 mg.m⁻² of oxidised developer scavenger as indicated in table 5 below
- 300 mg.m⁻² of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 2-hydroxy-4,6-dichloro-1,3,5-triazine, potassium salt hardener.

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The test elements are imagewise exposed through a step wedge with density increment 0.30 and thereafter subjected to the AGFA P-94 developing process.

In order to evaluate them for light fastness, the stepped magenta images obtained in this manner are irradiated through an ultraviolet filter in an Atlas device equipped with a 3500 W Xenon lamp.

In a second experiment, magenta images obtained in the above described way are stored in the dark at 60°C, 95%RH for 72 hours prior to light exposure in the Atlas device.

In all cases the light fastness of the magenta image is evaluated based on the percentage of the residual dye density after 30 kJ/cm² of light exposure (initial density = 1). The results are given in table 5.

Table 5

Test element	Interlayer Scavenger	Residual dye after 30 kJ.cm ⁻² of Atlas exposure (%)	
		no dark storage (60°C, 95% RH) prior to irradiation in the Atlas	72 h dark storage (60°C, 95% RH) prior to irradiation in the Atlas
34 (check)	none	75	75
35 (comparison)	A-1	74	60
36 (comparison)	A-2	71	45
37	Compound 7	76	77
38	Compound 12	77	74
39	Compound 21	75	75

From the data in table 5, it can be seen that the oxidised developer scavengers according to this invention are not detrimental at all to the light resistance of the magenta layer, whether the samples are subjected to a preliminary dark storage period at 60°C, 95%RH or not. In contrast, the comparison hydroquinone scavengers A-1 and A-2 clearly impair the light fastness of the magenta image after the samples had been left under a high temperature and humidity for 72 hours.

Example 6

Test element 40 is prepared by providing on a polyethylene-coated paper support a light-sensitive silver halide layer containing:

- 260 mg.m⁻² (based on silver) of an unsensitized silver bromide emulsion
- 5150 mg.m⁻² of gelatin
- 305 mg.m⁻² of magenta-dye-forming compound M-1
- 305 mg.m⁻² of tricresylphosphate

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- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 2-hydroxy-4,6-dichloro-1,3,5-triazine, potassium salt hardener
- 7-methyl-5-hydroxy-1,3,8-triazaindolizine antifoggant

Test elements 41 and 42 are prepared identically to test element 40, except that the emulsion layer additionally contains 30 mg.m⁻² and 75 mg.m⁻² of compound 7, respectively.

The prepared test elements are imagewise exposed through a step wedge with density increment 0.30 and thereafter subjected to the AGFA P-94 developing process.

The stepped magenta images obtained in this manner are irradiated through an ultraviolet filter in an Atlas device equipped with a 3500 W Xenon lamp.

The light fastness of the magenta image is evaluated based on the percentage of the residual dye density after 15 kJ/cm² of light exposure (initial density = 1). The results are given in table 6.

Table 6

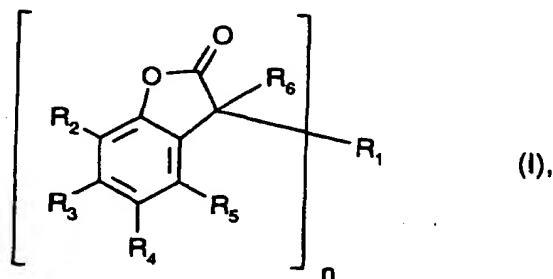
Test element	Benzofuranone	Residual dye after 15 kJ.cm ⁻² of Atlas exposure (%)
40 (control)	none	31
41	compound 7 (30 mg.m ⁻²)	48
42	compound 7 (75 mg.m ⁻²)	77

As compared to a layer without added benzofuranone, magenta layers containing compound 7 are much more stable to light. Thus, the benzofuranone derivatives according to this invention can also find utility as light stabilisers for magenta dyes derived from pyrazolo:azole couplers.

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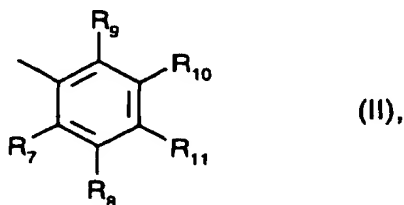
Claims:

1. Process for preventing migration of the oxidised developer in a colour photographic material from one colour sensitive layer to another by incorporating a compound of the formula I into said material



wherein, if $n = 1$,

R_1 is naphthyl, phenanthryl, anthryl, 5,6,7,8-tetrahydro-2-naphthyl, 5,6,7,8-tetrahydro-1-naphthyl, thienyl, benzo[b]thienyl, naphtho[2,3-b]thienyl, thianthrenyl, dibenzofuryl, chromenyl, xanthenyl, phenoxathiinyl, pyrrolyl, imidazolyl, pyrazolyl, pyrazinyl, pyrimidinyl, pyridazinyl, indoliziny, isoindolyl, indolyl, indazolyl, purinyl, quinoliziny, isoquinolyl, quinolyl, phthalazinyl, naphthyridinyl, quinoxaliny, quinazolinyl, cinnoliny, pteridinyl, carbazolyl, β -carboliny, phenanthridinyl, acridinyl, perimidinyl, phenanthrolinyl, phenazinyl, isothiazolyl, phenothiazinyl, isoxazolyl, furazanyl, biphenyl, terphenyl, fluorenyl or phenoxazinyl, each of which is unsubstituted or substituted by C_1 - C_4 alkyl, C_1 - C_4 alkoxy, C_1 - C_4 alkylthio, hydroxy, halogen, amino, C_1 - C_4 alkylamino, phenylamino or di(C_1 - C_4 -alkyl)amino, or R_1 is a radical of formula II



and, if $n = 2$,

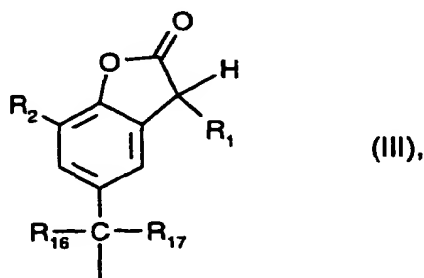
R_1 is unsubstituted or C_1 - C_4 alkyl- or hydroxy-substituted phenylene or naphthylene; or $-R_{12}-X-R_{13}-$,

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R_2 , R_3 , R_4 and R_5 are each independently of one another hydrogen, chloro, hydroxy, C_1 - C_{25} -alkyl, C_7 - C_9 phenylalkyl, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; unsubstituted or C_1 - C_4 alkyl-substituted C_5 - C_8 cycloalkyl; C_1 - C_{18} alkoxy, C_1 - C_{18} alkylthio, C_1 - C_4 alkylamino, di(C_1 - C_4 -alkyl)amino, C_1 - C_{25} alkanoyloxy, C_1 - C_{25} alkanoylamino, C_3 - C_{25} alkenoyloxy;

C_3 - C_{25} alkanoyloxy which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$; C_6 - C_9 cycloalkyl-

carbonyloxy, benzoyloxy or C_1 - C_{12} alkyl-substituted benzoyloxy; or R_2 and R_3 , or R_3 and R_4 , or R_4 and R_5 , together with the linking carbon atoms, form a benzene ring; or R_4 is $-C_mH_{2m}-COR_{15}$ or $-(CH_2)_qOH$ or, if R_3 , R_5 and R_6 are hydrogen, R_4 is additionally a radical of formula III



wherein R_1 is as defined above for $n = 1$;

R_6 is hydrogen or, when R_4 is hydroxy, R_6 can also be C_1 - C_{25} alkyl or C_3 - C_{25} alkenyl;

R_7 , R_8 , R_9 , R_{10} and R_{11} are each independently of one another hydrogen, halogen, hydroxy,

C_1 - C_{25} alkyl; C_2 - C_{25} alkyl which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$; C_1 - C_{25} alkoxy;

C_2 - C_{25} alkoxy which is interrupted by oxygen, sulfur or $\text{>N}-R_{14}$; C_1 - C_{25} alkylthio, C_3 - C_{25} -

alkenyl, C_3 - C_{25} alkenoyloxy, C_3 - C_{25} alkynyl, C_3 - C_{25} alkynyloxy, C_7 - C_9 phenylalkyl, C_7 - C_9 phenyl-alkoxy, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; unsubstituted or C_1 - C_4 alkyl-substituted phenoxy; unsubstituted or C_1 - C_4 alkyl-substituted C_5 - C_8 cycloalkyl; unsubstituted or C_1 - C_4 alkyl-substituted C_5 - C_8 cycloalkoxy; C_1 - C_4 alkylamino, di(C_1 - C_4 alkyl)amino, C_1 - C_{25} alka-

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noyl; C₃-C₂₅alkanoyl which is interrupted by oxygen, sulfur or >N-R_{14} ; C₁-C₂₅alkanoyl-

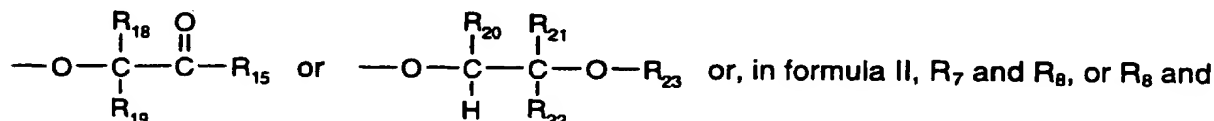
oxy; C₃-C₂₅alkanoyloxy which is interrupted by oxygen, sulfur or >N-R_{14} ; C₁-C₂₅alka-

noylamino, C₃-C₂₅alkenoyl; C₃-C₂₅alkenoyl which is interrupted by oxygen, sulfur or

>N-R_{14} ; C₃-C₂₅alkenoyloxy; C₃-C₂₅alkenoyloxy which is interrupted by oxygen, sulfur or

>N-R_{14} ; C₆-C₉cycloalkylcarbonyl, C₆-C₉cycloalkylcarbonyloxy, benzoyl or C₁-C₁₂alkyl-

substituted benzoyl; benzoyloxy or C₁-C₁₂alkyl-substituted benzoyloxy;

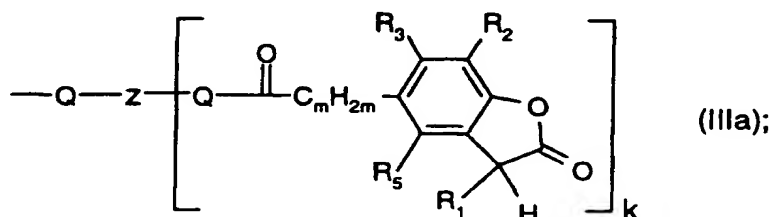


R₁₁, together with the linking carbon atoms, form a benzene ring,

R₁₂ and R₁₃ are each independently of the other unsubstituted or C₁-C₄alkyl-substituted phenylene or naphthylene,

R₁₄ is hydrogen or C₁-C₈alkyl,

R₁₅ is hydroxy, $\left[\text{—O}^- \frac{1}{r} \text{M}^{r+} \right]$, C₁-C₂₀alkoxy, $\text{—N}\begin{matrix} \text{R}_{24} \\ \text{R}_{25} \end{matrix}$, or a group of the formula IIIa



R₁₆ and R₁₇ are each independently of the other hydrogen, CF₃, C₁-C₁₂alkyl or phenyl, or R₁₆ and R₁₇, together with the linking carbon atom, are a C₅-C₈cycloalkylidene ring which is unsubstituted or substituted by 1 to 3 C₁-C₄alkyl;

R₁₈ and R₁₉ are each independently of the other hydrogen, C₁-C₄alkyl or phenyl,

R₂₀ is hydrogen or C₁-C₄alkyl,

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R_{21} is hydrogen, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; C_1 - C_{25} alkyl; C_2 - C_{25} alkyl

which is interrupted by oxygen, sulfur or $\text{N}-R_{14}$; C_7 - C_9 phenylalkyl which is unsubstituted

or substituted at the phenyl moiety by 1 to 3 C_1 - C_4 alkyl; C_7 - C_{25} phenylalkyl which is

interrupted by oxygen, sulfur or $\text{N}-R_{14}$ and which is unsubstituted or substituted at the

phenyl moiety by 1 to 3 C_1 - C_4 alkyl, or R_{20} and R_{21} , together with the linking carbon atoms,

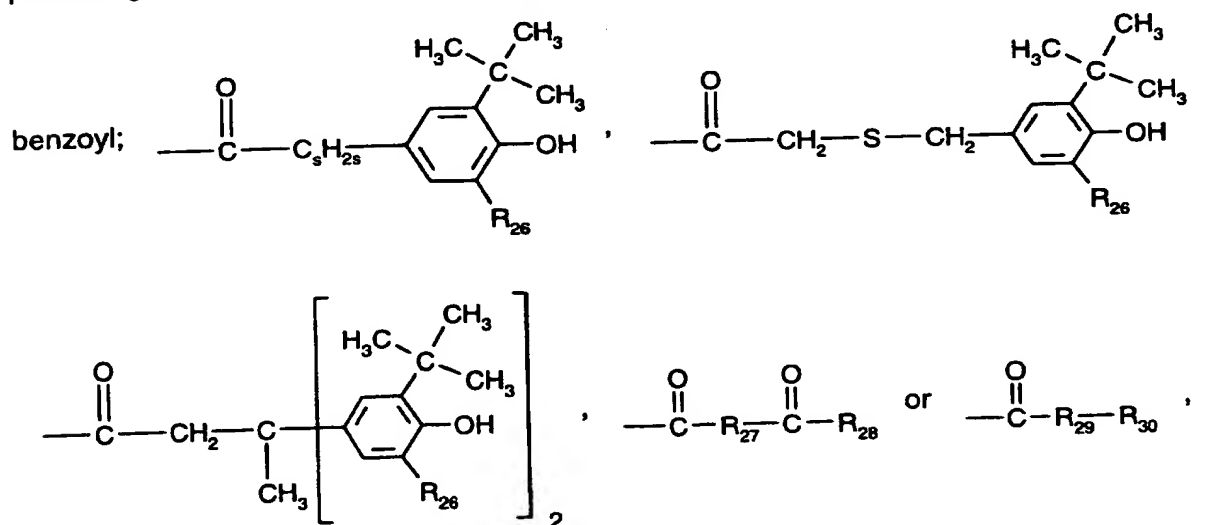
form a C_5 - C_{12} cycloalkylene ring which is unsubstituted or substituted by 1 to 3 C_1 - C_4 alkyl;

R_{22} is hydrogen or C_1 - C_4 alkyl,

R_{23} is hydrogen, C_1 - C_{25} alkanoyl, C_3 - C_{25} alkenoyl; C_3 - C_{25} alkanoyl which is interrupted by

oxygen, sulfur or $\text{N}-R_{14}$; C_2 - C_{25} alkanoyl which is substituted by a di(C_1 - C_6 alkyl)phos-

phonate group; C_6 - C_9 cycloalkylcarbonyl, thenoyl, furoyl, benzoyl or C_1 - C_{12} alkyl-substituted



R_{24} and R_{25} are each independently of the other hydrogen or C_1 - C_{18} alkyl,

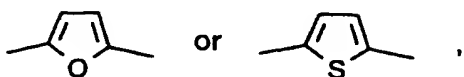
R_{26} is hydrogen or C_1 - C_8 alkyl,

R_{27} is a direct bond, C_1 - C_{18} alkylene; C_2 - C_{18} alkylene which is interrupted by oxygen, sulfur or

$\text{N}-R_{14}$; C_2 - C_{18} alkenylene, C_2 - C_{20} alkylidene, C_7 - C_{20} phenylalkylidene, C_5 - C_8 cycloalky-

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lene, C₇-C₈bicycloalkylene, unsubstituted or C₁-C₄alkyl-substituted phenylene,



R₂₈ is hydroxy, $\left[-O^- \frac{1}{r} M^{r+} \right]$, C₁-C₁₈alkoxy or $-N \begin{matrix} R_{24} \\ R_{25} \end{matrix}$,

R₂₉ is oxygen or -NH-,

R₃₀ is C₁-C₁₈alkyl or phenyl,

R₃₁ is hydrogen or C₁-C₁₈alkyl,

M is an r-valent metal cation,

Q is oxygen or -NH-,

X is a direct bond, oxygen, sulfur or -NR₃₁- ,

Z is a linking group of valency (k+1) and is as a divalent group C₂-C₁₂alkylene, Q-interrupted C₄-C₁₂alkylene, phenylene or phenylene-D-phenylene with D being C₁-C₄alkylene, O, S, SO or SO₂;

Z as a trivalent group is C₃-C₁₂alkanetriyl, a trivalent residue of a hexose or a hexitol, a group (-CH₂)₃C-CH₂OH, or a group -C_aH_{2a}-N(C_bH_{2b}-)-C_cH_{2c}-; and

Z as a tetravalent group is a tetravalent residue of a hexose or a hexitol, C₄-C₁₂alkanetetryl,



a, b, c and k independently are 1, 2 or 3,

m is 0 or a number from the range 1-12, preferably 1-6,

n is 1 or 2,

q is 1, 2, 3, 4, 5 or 6,

r is 1, 2 or 3, and

s is 0, 1 or 2;

provided that, when R₇ is hydroxy, alkanoyloxy or alkanoyloxy interrupted by O, S or N(R₁₄)

and R₉ is hydrogen, R₁₀ is not identical with R₄; and when R₉ is hydroxy, alkanoyloxy or

alkanoyloxy interrupted by O, S or N(R₁₄) and R₇ is hydrogen, R₈ is not identical with R₄.

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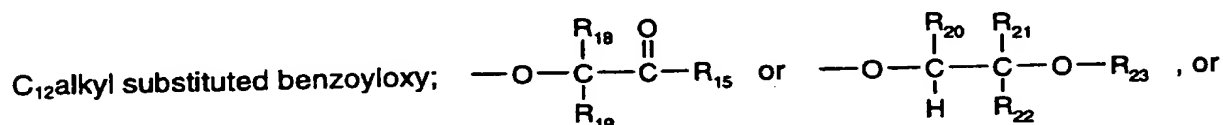
2. Process according to claim 1, wherein in the compound of formula I

R_2 , R_3 and R_5 , independently, are H, Cl, hydroxy, C_1 - C_{25} alkyl, C_7 - C_9 phenylalkyl, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; C_1 - C_{18} alkoxy, C_1 - C_{25} alkanoyloxy, C_3 - C_{25} alkenoyloxy; and where

R_4 is Cl, hydroxy, C_1 - C_{25} alkyl, C_7 - C_9 phenylalkyl, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; C_1 - C_{18} alkoxy, C_1 - C_{25} alkanoyloxy, C_3 - C_{25} alkenoyloxy or is a group $-C_mH_{2m}-COR_{15}$, or where R_3 , R_5 and R_6 are H, R_4 may be a residue of formula III, or where R_8 or R_{10} are other than H, R_4 may also be hydrogen;

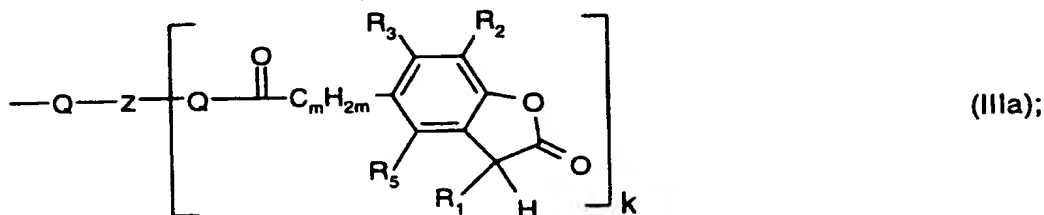
R_6 is H,

R_7 , R_8 , R_9 , R_{10} and R_{11} independently are H, halogen, hydroxy, C_1 - C_{25} alkyl, O interrupted C_2 - C_{25} alkyl; C_1 - C_{25} alkoxy, O interrupted C_2 - C_{25} alkoxy, C_3 - C_{25} alkenyl, C_3 - C_{25} alkenyloxy, C_7 - C_9 phenylalkyl, C_7 - C_9 phenylalkoxy, unsubstituted or C_1 - C_4 alkyl-substituted phenyl; unsubstituted or C_1 - C_4 alkyl substituted phenoxy; unsubstituted or C_1 - C_4 alkyl substituted C_5 - C_8 cycloalkyl; unsubstituted or C_1 - C_4 alkyl substituted C_5 - C_8 cycloalkoxy; C_1 - C_4 alkylamino, di- $(C_1$ - C_4 -alkyl)amino, C_1 - C_{25} alkanoyl; C_1 - C_{25} alkanoyloxy; C_6 - C_9 cycloalkylcarbonyl, C_6 - C_9 cycloalkylcarbonyloxy, benzoyl or C_1 - C_{12} alkyl-substituted benzoyl; benzoyloxy or C_1 -



where in formula II R_7 and R_8 or R_8 and R_{11} together with the carbon atoms, they are bonded to, form a phenyl ring;

R_{15} is C_1 - C_{18} alkoxy or
$$-N\begin{matrix} R_{24} \\ | \\ R_{25} \end{matrix}$$
 or a group of formula IIIa;



R_{16} and R_{17} independently are H, CF_3 , C_1 - C_{12} alkyl or phenyl; or R_{16} and R_{17} together with the bonding carbon atom form an unsubstituted or 1-3 C_1 - C_4 alkyl-substituted C_5 - C_8 cycloalkylidene ring;

R_{18} and R_{19} independently are H, C_1 - C_4 alkyl or phenyl;

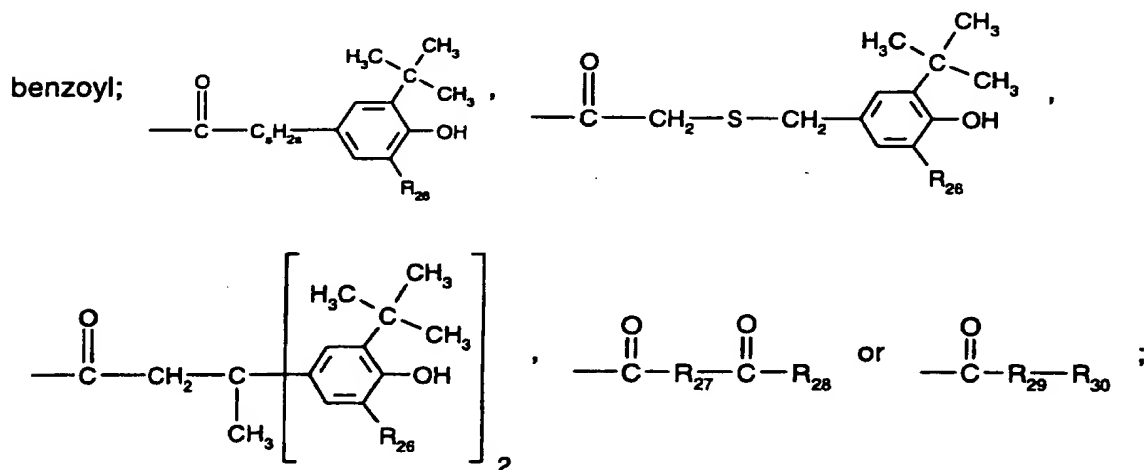
- 101 -

R_{20} is H or C_1 - C_4 alkyl;

R_{21} is H, unsubstituted or C_1 - C_4 alkyl substituted phenyl; C_1 - C_{25} alkyl, unsubstituted or on the phenyl ring 1-3 C_1 - C_4 alkyl-substituted C_7 - C_9 phenylalkyl;

R_{22} is H or C_1 - C_4 alkyl;

R_{23} is H, C_1 - C_{25} alkanoyl, C_3 - C_{25} alkenoyl; di(C_1 - C_6 alkyl)phosphonate-substituted C_2 - C_{25} alkanoyl; C_6 - C_9 cycloalkylcarbonyl, thenoyl, furoyl, benzoyl or C_1 - C_{12} alkyl-substituted

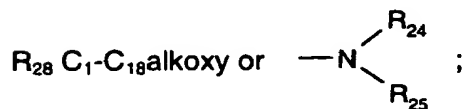
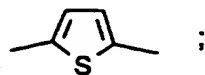


R_{24} and R_{25} independently are H or C_1 - C_{18} alkyl;

R_{26} is H or C_1 - C_8 alkyl;

R_{27} is a direct bond, C_1 - C_{18} alkylen, C_2 - C_{18} alkenylen, C_7 - C_{20} phenylalkyliden, C_5 -

C_8 cycloalkylen, unsubstituted or C_1 - C_4 alkyl-substituted phenylene,  or



R_{29} is O or -NH-;

R_{30} C_1 - C_{18} alkyl or phenyl;

M a metal cation of the valency r;

X a direct bond, O, S or - NR_{31} - ;

n 1 or 2;

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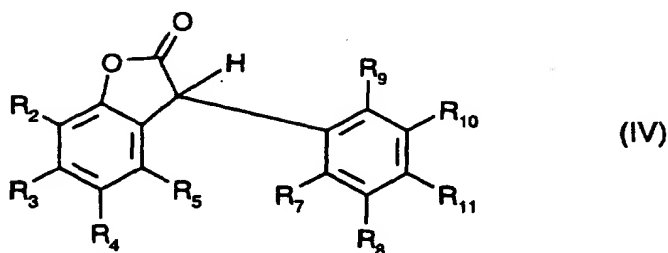
m is a number from the range 1-8;

q 1, 2, 3, 4, 5 or 6;

r 1, 2 or 3; and

s is 0, 1 or 2.

3. Process according to claim 1 wherein the compound of formula I corresponds to the formula IV

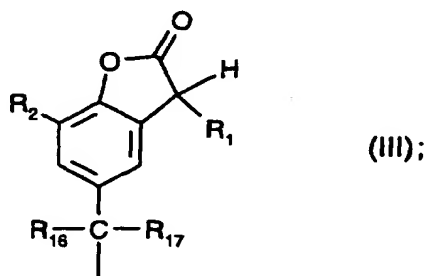


wherein

R₂ is H or C₁-C₂₀alkyl;

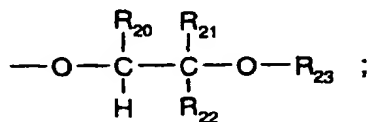
R₃ is H or C₁-C₁₈alkyl;

R₄ is C₁-C₈alkyl, H, C₁-C₆alkoxy or a group -C_mH_{2m}-COR₁₅ or a group of the formula III



R₅ is H or C₁-C₁₈alkyl;

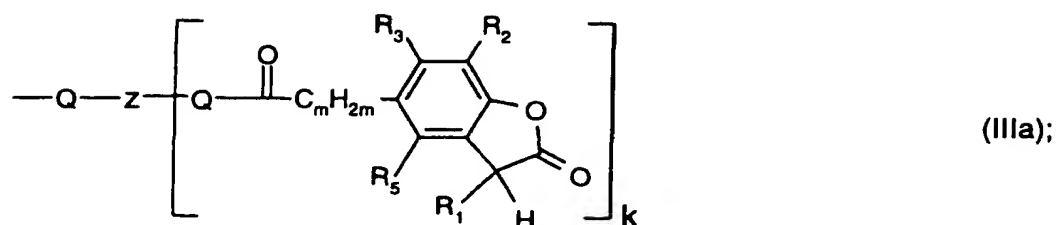
R₇, R₈, R₉, R₁₀ and R₁₁ independently are H, OH, chloro, C₁-C₁₈alkyl, C₁-C₁₈alkoxy, di(C₁-C₄alkyl)amino, phenyl, C₂-C₁₈alkanoyloxy, C₃-C₁₈-alkoxycarbonylalkoxy or



especially wherein at least 2 of the residues R₇, R₈, R₉, R₁₀, R₁₁ are H;

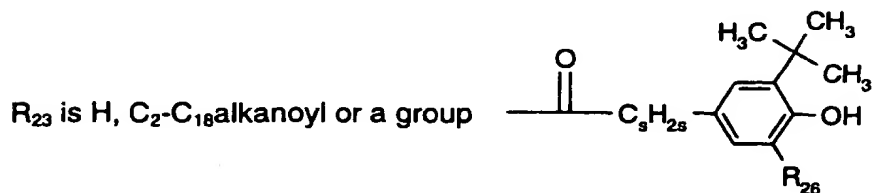
R₁₅ is C₁-C₁₈alkoxy or a group of the formula IIIa

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R_{16} and R_{17} independently are H, C_1 - C_{12} alkyl or phenyl; or R_{16} and R_{17} together with the bonding carbon atom form a C_5 - C_8 cycloalkylidene ring;

R_{20} , R_{21} and R_{22} independently are H or C_1 - C_4 alkyl;



R_{26} is C_1 - C_4 alkyl;

Q is oxygen;

Z is C_2 - C_{12} alkylene;

k is 1;

m is 1, 2, 3, 4, 5 or 6 and

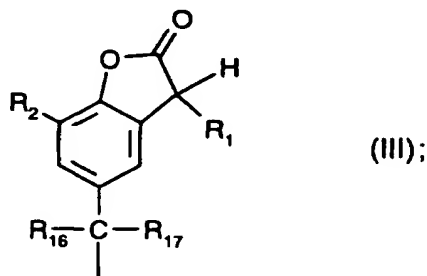
s is 0, 1 or 2.

4. Process according to claim 3 wherein in the compound of formula IV

R_2 is C_1 - C_{20} alkyl;

R_3 is H or C_1 - C_{18} alkyl;

R_4 is C_1 - C_6 alkyl, C_1 - C_6 alkoxy or a group $-C_mH_{2m}-COR_{15}$ or a group of the formula III



R_5 is H or C_1 - C_{18} alkyl;

R_7 and R_9 independently are H, chloro, C_1 - C_{18} alkyl;

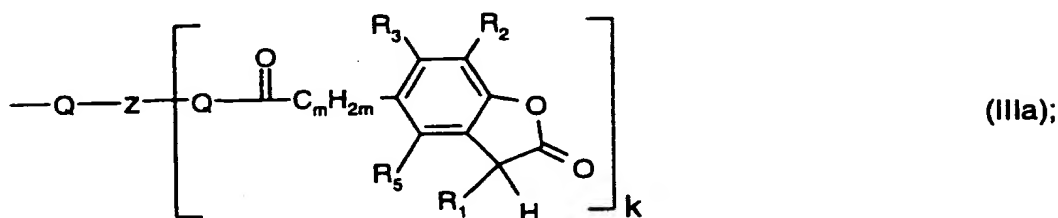
;

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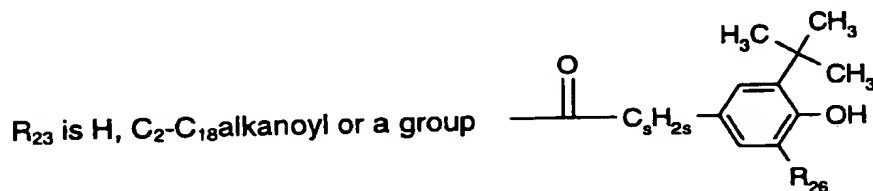
R_8 , R_{10} and R_{11} , independently are H, OH, chloro, C_1 - C_{18} alkyl, C_1 - C_{18} alkoxy, di(C_1 -

C_4 alkyl)amino, phenyl, C_2 - C_{18} alkanoyloxy or $\text{---O---}\begin{array}{c} R_{20} \quad R_{21} \\ | \quad | \\ \text{---C---C---} \\ | \quad | \\ \text{H} \quad R_{22} \end{array}\text{---O---}R_{23}$

R_{15} is C_1 - C_{18} alkoxy or a group of the formula IIIa



R_{20} , R_{21} and R_{22} are H;



R_{26} is C_1 - C_4 alkyl;

Q is oxygen;

Z is C_2 - C_{12} alkylene;

k is 1;

m is 1, 2, 3, 4, 5 or 6 and

s is 0, 1 or 2.

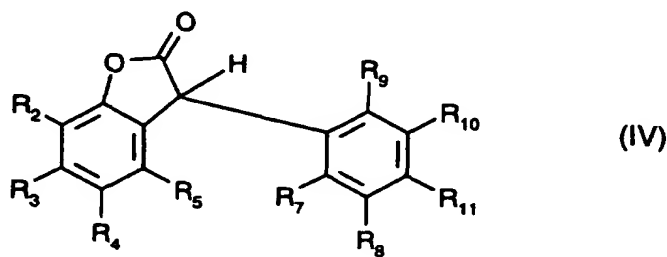
5. Process according to claim 3 where in the compound of formula IV

R_7 is H and R_9 is H or methyl and wherein R_2 , R_3 , R_4 , R_5 , R_6 , R_8 , R_9 , R_{10} , and R_{11} together contain at least 3 carbon atoms.

6. Process according to claim 3 wherein in the compound of formula IV, R_4 is C_1 - C_6 alkyl, especially tertiary C_4 - C_6 alkyl, or a group $\text{---C}_m\text{H}_{2m}\text{---COR}_{15}$ or a group of the formula III.

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7. Process according to claim 1, wherein the compound of formula I is incorporated into the colour photographic material in an amount from 10 to 1000 mg/m².
8. Process according to claim 1, wherein the compound of formula I is concentrated in one or more interlayers separating the light sensitive layers of the colour photographic material.
9. Use of a compound of the formula I according to claim 1 as a scavenger for the oxidized developer in a colour photographic material.
10. A colour photographic material containing a compound of the formula IV

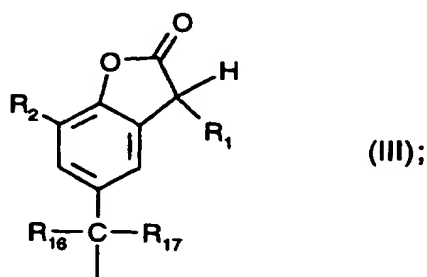


wherein

R₂ is H or C₁-C₂₀alkyl;

R₃ is H or C₁-C₁₈alkyl;

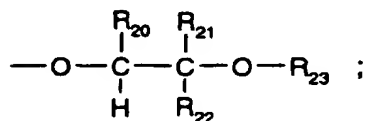
R₄ is C₁-C₈alkyl, C₁-C₆alkoxy or a group -C_mH_{2m}-COR₁₅ or a group of the formula III



R₅ is H or C₁-C₁₈alkyl;

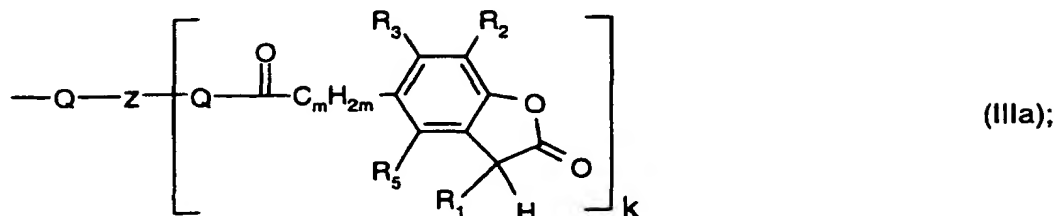
R₇ and R₉ independently are H, chloro, C₁-C₁₈alkyl or phenyl;

R₈, R₁₀ and R₁₁ independently are H, OH, chloro, C₁-C₁₈alkyl, C₁-C₁₈alkoxy, di(C₁-C₄alkyl)amino, phenyl, C₂-C₁₈alkanoyloxy, C₃-C₁₈-alkoxycarbonylalkoxy or



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R_{15} is C_1 - C_{18} alkoxy or a group of the formula IIIa



R_{16} and R_{17} independently are H, C_1 - C_{12} alkyl or phenyl; or R_{16} and R_{17} together with the bonding carbon atom form a C_5 - C_8 cycloalkylidene ring;

R_{20} , R_{21} and R_{22} independently are H or C_1 - C_4 alkyl;



R_{26} is C_1 - C_4 alkyl;

Q is oxygen;

Z is C_2 - C_{12} alkylene;

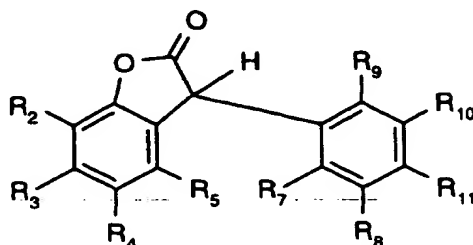
k is 1;

m is 1, 2, 3, 4, 5 or 6 and

s is 0, 1 or 2.

11. Use of a compound of the formula IV according to claim 11 as an additive in a colour photographic material.

12. Compound of the formula V:



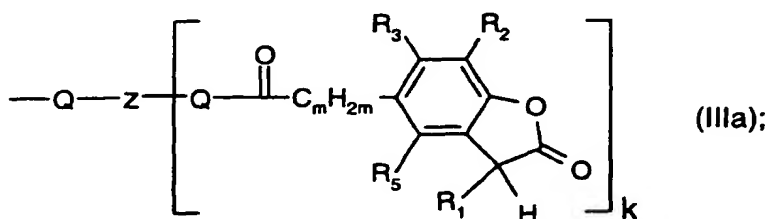
(V),

wherein

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R_4 is $-(CH_2)_s-COR'_{15}$ or $-C_pH_{2p}-COR_{15}$ or $-C_tH_{2t}-COR_{15}$, wherein the alkylene moiety C_pH_{2p} is branched alkylene and the alkylene moiety C_tH_{2t} is a straight chain or branched alkylene moiety;

R_{15} is hydroxy, $\left[-O^- \frac{1}{r} M^{r+}\right]$, C_1-C_{20} alkoxy, $-N \begin{smallmatrix} R_{24} \\ R_{25} \end{smallmatrix}$, or a group of the formula IIIa



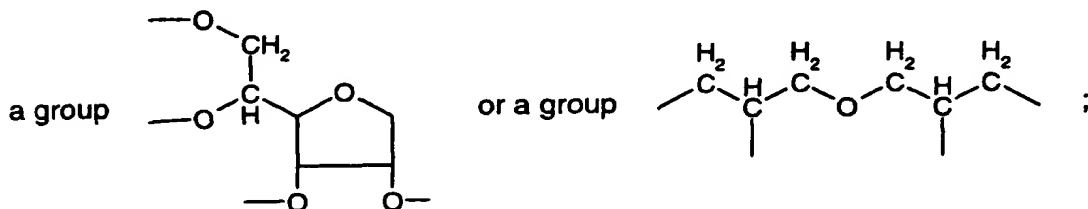
R'_{15} is a group of formula IIIa;

Q is oxygen or $-NH-$,

Z is a linking group of valency $(k+1)$ and is as a divalent group C_2-C_{12} alkylene, Q-interrupted C_4-C_{12} alkylene, phenylene or phenylene-D-phenylene with D being C_1-C_4 alkylene, O, S, SO or SO_2 ;

Z as a trivalent group is C_3-C_{12} alkanetriyl, a trivalent residue of a hexose or a hexitol, a group $(-CH_2)_3C-CH_2OH$, or a group $-C_aH_{2a}-N(C_bH_{2b})-C_cH_{2c}$; and

Z as a tetravalent group is a tetravalent residue of a hexose or a hexitol, C_4-C_{12} alkanetetriyl,



a, b, c and k independently are 1, 2 or 3,

m is 0 or a number from the range 1-12, preferably 1-6,

p is 1 or 2;

s is 1 or 2;

t is a number from the range 3-12, preferably 3-6;

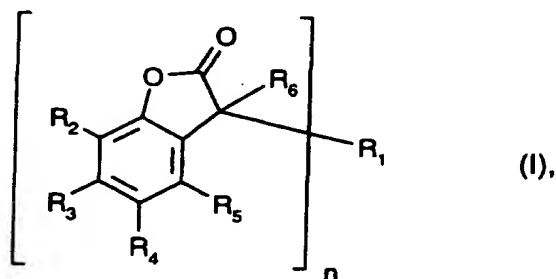
and all other residues are as defined in claim 1 for formula I if n is 1.

13. Use of a compound of the formula V according to claim 14 as stabilizer for organic material against deterioration by light, oxygen and/or heat.

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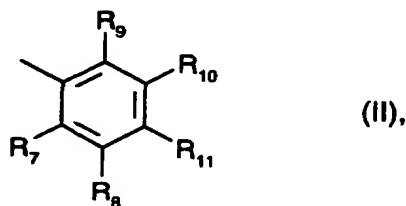
Abstract

A colour photographic material is described containing a compound of the formula I



wherein, if $n = 1$,

R_1 is, inter alia, a radical of formula II



and, if $n = 2$,

R_1 is unsubstituted or C_1 - C_4 alkyl- or hydroxy-substituted phenylene or naphthylene; or $-R_{12}-X-R_{13}-$, and other residues are as defined in claim 1. The compound of the formula I is effective as scavenger of the oxidised form of the developer (Dox scavenger), especially when contained in an interlayer between light sensitive layers. Selected compounds of this class can also be used as additives, for example as dye stabilizer, in colour photographic materials.

